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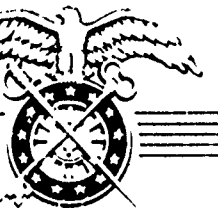
TECHNICAL REPORT

EP-111

CLIMATIC ANALOGS OF FORT GREELY, ALASKA AND FORT CHURCHILL, CANADA IN NORTH AMERICA



QUARTERMASTER RESEARCH & ENGINEERING CENTER
ENVIRONMENTAL PROTECTION RESEARCH DIVISION

MAY 1959

NATICK, MASSACHUSETTS

HEADQUARTERS
QUARTERMASTER RESEARCH & ENGINEERING COMMAND, US ARMY
OFFICE OF THE COMMANDING GENERAL
NATICK, MASSACHUSETTS

Major General Andrew T. McNamara
The Quartermaster General
Department of the Army
Washington 25, D. C.

Dear General McNamara:

This report, "Climatic Analogs of Fort Greely and Fort Churchill in North America", compares climatic conditions throughout northern North America with those at two Department of the Army cold-weather test sites.

The analysis of individual climatic elements shows large areas of close analogy with each test site. Combinations of elements (e.g., composite of winter and summer temperatures with mean annual precipitation) however, show much smaller areas of analogy.

The distributions mapped in this study provide a basis for determining the degree to which each test site is climatically representative of the North American Arctic and Subarctic. The study will aid test and design personnel in estimating regional suitability of end items based upon performance trials conducted at either test site. Furthermore, areas of more severe climatic stress, shown in this report, should be considered when clothing and equipage are being designed for use in the extreme cold.

Sincerely yours,

C. G. Calloway

C. G. CALLOWAY
Major General, USA
Commanding

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EP-111

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Quartermaster Research & Engineering Center
Natick, Massachusetts

ENVIRONMENTAL PROTECTION RESEARCH DIVISION

Technical Report

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CLIMATIC ANALOGS OF FORT GREELY, ALASKA, AND FORT CHURCHILL, CANADA, IN NORTH AMERICA

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Geographer

REGIONAL ENVIRONMENTS RESEARCH BRANCH

Prepared for the R&D Project "Military Evaluation of Geographic Areas" (8-70-09-400), U. S. Army Engineer Waterways Experiment Station Vicksburg, Mississippi

Project Reference:
7-83-01-005

May 1959

Foreword

This report is one of a series designed to determine the extent of world areas having climates similar to those of the various Department of the Army test sites. The present study compares climatic conditions at Fort Greely, Alaska, and Fort Churchill, Manitoba, Canada, with those of other parts of northern North America as well as certain western islands of Europe (Iceland, Jan Mayen, the Faeroes, and the British Isles). Data are plotted as far south as 45° North latitude.

The series of climatic analog studies, prepared at the request of the U.S. Army Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi, is part of a program for evaluating the suitability and representativeness of all Department of the Army test sites. They constitute the Quartermaster Corps contribution to the Corps of Engineers project on "Military Evaluation of Geographic Areas."

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Environmental Protection Research Division

Approved:

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Contents

Abstract

Fort Greely, Alaska, and Fort Churchill, Manitoba, Canada, are used by the Armed Forces of the United States as cold-weather field laboratories where physiological performance studies are conducted and effectiveness of clothing and equipment for cold climate operations is evaluated. This study undertakes to indicate the extent to which the climatic environment at each of the test sites is representative of arctic and subarctic areas elsewhere in North America.

Twelve climatic elements are mapped and analogous areas are indicated. Ranges of analogy vary with the element being measured, but for most elements the southern limit of close analogy for both test sites lies north of the 45° parallel (roughly the northern tier of states in the United States). Areas of analogy are designated on the maps by yellow areas for Fort Greely and blue areas for Fort Churchill. Except for absolute minimum temperature, Fort Churchill has the colder environment of the two sites; hence the more northerly zone of cold analogy shown is usually that of Fort Churchill. Areas of analogy for both test sites tend to extend farthest southward over midcontinent regions.

Composite areas of analogy for multiple elements are also mapped. Areas analogous to Fort Churchill for combined coldest month temperatures, snow depth, and windchill are found primarily in the Hudson Bay Lowland. For Fort Greely, analogous areas for the above combination of elements are confined to the immediate vicinity of Fort Greely, northwestern Alaska, southern Manitoba, and small areas on the coast of Greenland.

Areas of composite analogy with Fort Greely for winter and summer temperature and mean annual precipitation occur in the Tanana Valley of Alaska, southern Yukon Territory, and in small scattered areas of western Alaska. Fort Churchill analogy for the same combination of elements occurs in a 500-mile-wide salient stretching westward from Hudson Bay and a smaller patch in interior northern Quebec.

CLIMATIC ANALOGS OF FORT GREELY, ALASKA, AND FORT CHURCHILL, CANADA, IN NORTH AMERICA

1. Introduction

This study was prepared in answer to a request from the Office, Chief of Engineers, for a climatic comparison of the arctic and subarctic regions of the world with Fort Greely, Alaska, and Fort Churchill, Manitoba, Canada. It is the second of two reports, each treating one-half of the Northern Hemisphere north of 45° N. latitude; the first covered Eurasia. The land areas covered in this, the western portion, include North America, and certain western islands of Europe (Iceland, Jan Mayen Island, the Faeroe Islands, and the British Isles).

Only those climatic elements which seem to best define stress factors in cold environments were selected for the study. For each selected element a map (or maps) has been prepared showing areas having conditions considered analogous to those at Fort Greely and Fort Churchill. Information from some of these maps has been consolidated on composite maps to show areas of coincidence of analogous elements.

The climatic conditions at Fort Greely and Fort Churchill have been summarized and evaluated by the Environmental Protection Research Division in the following publications:

Handbook of Fort Churchill Environment, Technical Report EP-4 (25)

Handbook of Big Delta*, Alaska, Environment, Technical Report EP-5 (23)

Data from these and other studies listed in the bibliography furnished the bases for comparison in this report.

2. Major physical features (Fig. 2)

Physiographically, the arctic and subarctic North American mainland have a certain basic uniformity. The terrain of the interior is relatively low and gentle and bordering uplands lie on or near the east and west coasts.

The Hudson Bay Lowland and its northward extension into the Arctic Archipelago form a broad depression with Hudson Bay in the center. This is a country of boggy tundra which lies, for the most part, close to sea level.

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* Renamed Fort Greely in August, 1955

Fort Churchill is located within this area on the west shore of Hudson Bay at the mouth of the Churchill River; the meteorological station is on a low moraine with the Bay to the north and relatively level muskeg to the south.

Except in the extreme insular north, this lowland is bordered by the Canadian Shield (Laurentian Upland). Here the term "upland" can be somewhat misleading. Although isolated elevations within this region exceed 3,000 feet, the transition from lowland to shield topography is gradual in many areas and much of the upland averages no more than 300 feet above sea level. Basically the shield is distinctive because of its old crystalline bedrock rather than its elevation.

In the District of Keewatin the Shield extends north of the forested subarctic as a moss-covered barren. South and southeastward it becomes a subdued upland covered by taiga forest. The taiga is a diverse wilderness of dense spruce forests, muskeg, lakes, barren knobs, glacial debris, and patternless water courses. Tree line is a relatively sharp break in many instances; where the forest ends, tundra begins, with scattered outlying trees in protected spots.

A nearly continuous fringe of lowlands surrounds the Shield country from the lower Mackenzie Valley (Mackenzie Lowland) in the northwest down through the northern United States (Central Lowlands and Great Lakes Lowland) and on around to Hudson Strait in northern Quebec. This lowland is prominently marked by a succession of some of the largest lakes on the continent: Great Bear, Great Slave, Athabaska, Winnipeg, Lake of the Woods, and the Great Lakes.

Southwestward the lowland slopes gently upward to reach over 4,000 feet in the Great Plains. The rise into the Franklin and Mackenzie Mountains in the northwest and into the Appalachian Plateau and related uplands of the southeast is far more abrupt.

The major highlands of the continent rise beyond the belt of circumferential lowlands and transitional plains. In the west, the great ranges of the Rocky Mountains stretch from the Mackenzie Mountains near the Beaufort Sea to well south of the area in the United States shown on the maps in this report. In the east, lower and more discontinuous mountains rim the Atlantic Coast of the continent from the Appalachian Mountains to northern Ellesmere Island. Highest summits of the eastern ranges average little more than 5,000 feet; those of the Rockies are well over twice as high. West of the Rockies lies a fairly continuous band of intermontane plateaus extending from the Columbia Plateau in the United States to the Tanana Hills of Alaska.

Along the western margin of the continent, coastal ranges form a high, nearly continuous wall from the Aleutian Chain to Mexico. Alaskan coastal mountains are heavily mantled with icecaps and valley glaciers, with tongues of the glaciers often terminating in the coastal waters. The Malespina and Bering Glaciers fan out on the coastal plain of southern Alaska to form two of the largest piedmont glaciers in the world. Glaciers and permanent snow fields are common at higher elevations as far south as southern British Columbia. Even the Cascades in Oregon support a few glaciers.

Icefields are rare in the Rocky Mountains north of the Yukon-British Columbia boundary because the coastal ranges effectively impede the passage of moisture-bearing winds from the west. In southern Alberta and British Columbia, significant icefields do occur mainly as a result of considerably higher elevations and a rather broad system of transverse valleys through the coastal ranges which give access to the westerly winds.

Southern Alaska is dominated by the extensively glaciated Alaska Range and its eastern extension, the Wrangell Mountains. North of these ranges the valley of the Yukon River and its tributary, the Tanana River, drain westward from Yukon Territory. Fort Greely is situated in the Tanana Valley at the point where the Delta River joins the valley, about halfway between the Canadian border and the confluence of the Tanana and the Yukon rivers. The elevation at Fort Greely is 1,274 feet. Within 40 miles to the south, glaciated summits around Mount Hayes rise to over 13,000 feet.

In the central region of Alaska, forested plains penetrate far inland along major streams. These river plains are separated by clusters of dissected uplands such as the Kilbuck Mountains, the Kuskokwim Range, and the mountains in the area bordering Bering Strait.

North of the central valleys rise the barren summits of the Brooks Range. Poleward from there, the northern coastal lowland, or Arctic Shelf, reaches across all of northern Alaska and southwestward along the Bering Strait.

Of Greenland's total area of 840,000 square miles, over 705,000 are blanketed with a great ice sheet rising from valley glaciers on or near the coasts to an interior plateau level of about 10,000 feet. Although mountain peaks are prominent (some over 11,000 feet) along the east coast, the overall aspect of the island is one of a uniformly domed icecap bordered by a relatively narrow fringe of fiorded coast.

Iceland is a volcanic island which averages about 2,500 feet above sea level with ice-capped highlands nearly 7,000 feet high in the southeast. Very narrow lowlands are confined mainly to the southwest and north coasts.

Ireland is largely deforested lowland. Small upland areas occur principally along the northwest and southeast coasts. On the island of Great Britain, rolling, low topography characterizes most of England, but the Pennine Chain, with elevations of about 1,500 feet, forms a prominent north-south spine in the northern interior. The Cambrian Mountains of Wales average about 2,000 feet, topped by Mount Snowdon, 3,560 feet. The Highlands of Scotland have many elevations above 3,000 feet. Ben Nevis, the highest peak, is over 4,400 feet and has a permanent snowfield in the Great Corrie of Allt-a-Mhullin.

The eastern tip of Siberia and the northwest coast of France, which both appear in the map area, are discussed in the Eurasian counterpart of this study.(28)

3. Climate

Arctic North America is an area of extremely cold winters, cool or cold summers, and scanty precipitation, most of which falls as snow, usually heaviest in autumn. These conditions are most extreme in interior Greenland where mean annual temperatures average about -20°F and summer temperatures seldom, if ever, rise above freezing. Included in the Arctic climatic region as used here, are the eastern Arctic Shelf of Alaska, most of the Arctic Archipelago and Keewatin Barrens, and practically all of Greenland. Southern Greenland coasts have cool to cold winters and cool summers with moderate precipitation on the southwest coast and heavy precipitation in the southeast. Most of the precipitation in the south falls as snow, with a winter maximum. Most coastal locations on the southeast side of Baffin Island have conditions similar to those of the southwest Greenland littoral. The arctic region extends southward in a broad salient across the Keewatin and eastern Mackenzie District barrens.

In the Great Bear Lake area of Mackenzie District and along the northwest coast of Alaska, winters are somewhat less severe and summers slightly warmer, but precipitation remains scanty. Throughout the Brooks Range of Alaska and in some valleys of southern Yukon Territory in the Whitehorse-Teslin area, precipitation averages less than 10 inches per year, winters are very cold, and summers are generally warm.

A large central continent area, including the shores of Hudson Bay and the Ungava section of northern Quebec, has very cold winters, cool summers, and light precipitation. Precipitation is concentrated in late summer or early autumn. The area receives 10 to 20 inches of precipitation annually, 30 to 50 percent of which falls as snow. The site at Fort Churchill lies within this area and may be regarded as typical.

In most of the southern interior of Canada east of the Rocky Mountains and northwestward through southern Mackenzie District, central Yukon,

interior Alaskan valleys, and the Gulkana Basin, there is a zone of very cold winters, warm summers, and light to moderate precipitation. This is the region in which Fort Greely is located. Annual precipitation, usually with a midsummer maximum, is lightest in Alaska and northwestern Canada and gradually increases southeastward to over 30 inches in central Quebec. Some places in the Yukon and the southern Prairie Provinces receive less than 40 inches of snow annually, but this too increases eastward, until it is over 200 inches per year in parts of Quebec and Newfoundland.

On either side of the Rocky Mountains in British Columbia and Alberta are foothill areas which are somewhat warmer in winter than the wide cross-continent zone immediately to the north and east. Summers in this area are warm and precipitation is light to moderate, depending upon local exposure.

The western mountains themselves have more precipitation, very cold winters, and warm summer days with cool nights. Snowfall increases rapidly with elevation and some stations at high elevations in the Rocky Mountains receive nearly 400 inches annually.

Montana and the Dakotas have cold winters and hot summers, with light precipitation reaching its maximum in early summer. Eastward through the Great Lakes to the St. Lawrence Valley, New England, and the Maritime Provinces, winters are cool or cold, summers are warm, and the precipitation is varied both in time of maximum and intensity. In the Great Lakes vicinity, precipitation is moderate and falls most heavily in spring and autumn. Nearly all of southern Quebec and all except the very southernmost coasts of the Maritimes receive between 30 and 50 inches of precipitation with a maximum in late summer, including at least 100 inches of snow in most areas.

The coasts of New England and the southeastern Maritimes have cool winters, warm summers, frequent fogs, and 40 to 60 inches of precipitation, with a tendency toward a winter or late autumn maximum.

The Pacific Coast littoral of British Columbia, Washington, and Oregon has mild, damp winters, warm, humid summers, and very heavy precipitation falling mostly as rain with a maximum in winter. Certain places on the British Columbian coast receive over 200 inches of precipitation.

Western Alaskan coasts have moderate precipitation, heaviest in autumn, 40 to 60 inches of snowfall, cold to very cold winters and cool summers. The Aleutian Islands have cool winters and summers, frequent fogs and high wind, and heavy precipitation. East of Kodiak, the Alaskan coast has heavy precipitation and cool winters, but summers are warmer here. Very heavy snowfall occurs in the Alaskan Panhandle, with some locations receiving over 400 inches per year. This is also generally true of the British Columbian coastal ranges and the Cascade Mountains of Washington and Oregon. East of the Cascades, the interior valleys have cool winters, hot, dry summers, and scanty precipitation.

Most of Iceland has moderate precipitation, usually in the form of rain or sleet, falling mostly in winter. Only the southern littoral zone receives heavy precipitation. Cool winters and cool summers prevail over all but the highest, glaciated parts of the island.

Moderate to heavy precipitation falls in the British Isles, mostly as rain, reaching its greatest intensity in late autumn and winter but with no dry season at any time of year. Like the coast of British Columbia, the British Isles have mild winters and warm summers.

4. Analysis of climatic elements

The maps included in this study cover certain basic climatic elements considered essential to an understanding of the environment of the area: elements which reflect stress on men and materiel in the Arctic and Subarctic.

Close analogy of any climatic element to that of the test sites is shown on the maps by means of station symbols and colored overprints, blue for Fort Churchill and yellow for Fort Greely. Overlap of these colors in areas analogous to both sites produces a green tone on the maps. Degree of analogy for each observation station is indicated by station symbols, which are defined on the map legends. Numerical values of each element are given beside the appropriate station symbol.

Figure 1 shows the weather stations from which data were used in the various map analyses. Figure 2 is a reference map of major physiographic regions, with mountains and icecaps differentiated in color.

On the individual climatic maps, only those stations actually used in a particular analysis are shown. They vary in density of distribution from map to map, depending upon the availability of data.

The relative reliability of the position of isopleths is indicated as follows: solid lines indicate fair to good reliability and dashed lines, poor reliability. Lines indicating poor reliability appear in mountainous areas, the uninhabited Arctic, and other remote places for which adequate meteorological data are not available. The complex influence of elevation is evidenced only in a general way where such effect is actually reflected by station data. No attempt was made to differentiate reliability of lines on the composite maps, Figures 14, 15, and 16.

Additional comments concerning determination of analogous ranges and details of evaluation are given in the following discussion of separate climatic elements. The associated map figure is indicated beside element subtitle.

a. Mean Temperature, Coldest Month (Fig. 3)

Fort Churchill -19°F (January)
Fort Greely -5°F (January)

Standard deviation was considered in determining the analogous ranges of mean monthly temperature. A range of mean temperatures, within which the average temperature of a single January could be expected to occur in 50 percent of the years, was regarded as a reasonable basis for delimiting close analogy.

Fort Churchill has a standard deviation of 7 F° from the mean temperature of its coldest month. The 50 percent expectancy level falls within ±4.9 F° of the long-term monthly mean. Fort Greely, with a standard deviation of approximately 9 F°, establishes 50 percent expectancy within ±6.3 F° of the long-term mean. The average range then, between the two sites, is ±5.6 F°. Previous analog studies have used a range of ± 5F° for temperature. In this case precedent agreed so closely with standard deviation determinations that the more convenient 5 F° increment was adopted. Thus, a range of ±5 F° from mean was considered "closely analogous". The next 5 F° above and below this range were regarded as "semianalogous". This range was used for all temperature maps.

For stations with means at either limit of analogy, but with standard deviations differing from those of the test sites, the probability of their means for a given year being within the 10-degree range would decrease at stations with higher standard deviations and increase at stations with lower standard deviations.

Areas analogous to the two test sites appear separate on the map because the difference between the mean temperatures at the sites exceeds 10 F degrees. The areas form broad, undulating belts dipping far south over midcontinent, and almost encircling Greenland. Fort Greely analogy reaches as far as northernmost United States in the Montana Rockies, northern North Dakota, and Minnesota. The cold nucleus of north-central Canada and the arctic islands is much colder than either test site.

The coldest month is January in most areas throughout interior Alaska, Canada, and the United States. December is coldest in a narrow area along the northwest flanks of the Alaska Range. February is generally the coldest month in Greenland and the Arctic Archipelago, except on Melville Sound,

between Baffin Bay and the Beaufort Sea. In many maritime locations seasons are delayed, February being the coldest month, August the warmest. The Canadian Maritime Provinces, the Great Lakes region, and most of the coast of Labrador are also coldest in February. In certain locations in the Bering Strait, the north side of the Aleutian Peninsula, and the southeast coast of Iceland, the coldest period occurs as late as March. The coldest month is also February in parts of the coastal area of the British Isles and western North America.

b. Mean Daily Minimum Temperature, Coldest Month (Fig. 4)

Fort Churchill	-27°F (January)
Fort Greely	-13°F (January)

With minor variations, the mean daily minimum temperature map for the coldest month shows essentially the same distribution of analogous areas as the mean monthly temperature map. One of these exceptions is the small coastal area in Northern Greenland, which is analogous to Fort Churchill in respect to mean temperature, but has mean daily minimum temperatures too cold for analogy.

c. Absolute Minimum Temperature (Fig. 5)

Fort Churchill	-57°F (January)
Fort Greely	-65°F (January)

The area of close analogy with Fort Churchill extends from the Beaufort Sea to Wyoming through 30 degrees of latitude. Fort Greely analogy occurs in interior locations encircling the coldest spots of North America. These cold spots, with temperatures too low for close analogy to Fort Greely, are found in central Alaska and the Yukon to the Mackenzie Valley, the Peace River Valley of British Columbia and Alberta, interior Greenland and Ellesmere Island, and in localized spots around Copper Center, Alaska; Prince Albert, Saskatchewan; Rogers Pass, Montana; and Iroquois Falls, Ontario. The lowest temperature on record for North America, exclusive of Greenland, is -81°F at Snag, Yukon. The Greenland icecap stations, North Ice and Central Station, have each recorded -87°F during different 2-year periods.

d. Mean Windchill, Coldest Month (Fig. 6)

Fort Churchill	1820 Kg Cals/m^2/hr (January)
Fort Greely	1630 " " " " (January)

Windchill is, in a sense, a measure of human discomfort, since it is the cooling effect of moving air on the human body. It is based upon an empirical formula determined by Siple and Passel (Antartica in 1940) (53)

from xperiments with the freezing rate of water in a plastic cylinder. The formula is used to compute kilogram calories of heat loss per square meter of exposed skin surface per hour for each Centigrade degree of temperature difference between the skin and the air. It is written: $H = (\sqrt{100\,V} + 10.45 - V)(33-T)$, where H = Windchill in Kg Cals/m^2/hr, V = wind velocity in meters per second, and T = ambient temperature in degrees Centigrade.

This formula is best applied to simultaneous wind and temperature measurements from hourly records, but such records have not been available in sufficient numbers to map. For this reason monthly mean values of temperature and windspeed were used in this study. Calculations by Arnold Court (20) indicate that the use of such mean values gives results reasonably comparable with those using hourly values. Because of the scarcity of good summarized wind data for northern Canada, however, most of the isopleths on Figure 6 are classed as having poor reliability.

The mean windspeed of the coldest month at Fort Greely is 17 miles per hour. A range from 15 to 19 miles per hour was considered closely analogous. For Fort Churchill, with a mean windspeed of 15 miles per hour, for the coldest month, a range from 13 to 17 miles per hour was used. These ranges were plotted on a windchill nomogram (inset on Fig. 6) together with the corresponding mean temperature ranges (Fig. 3) to derive the range of windchill analogy. Close analogy for windchill then falls within a range of plus or minus 130 Kilogram Calories from the mean windchill at the test sites.

It will be noted that the windchill map shows a predominance of isopleths which show poor reliability. This is due to the difficulty in obtaining satisfactory wind data in suitable quantities for Canadian stations.

Fort Greely analogy extends southward to the south end of Lake Winnipeg in Manitoba. The southern limit of Fort Churchill analogy agrees roughly with the northern tree line across the mainland.

e. Mean Cloudiness, Coldest Month (Fig. 7)

Fort Churchill	4.7 tenths of sky cover (January)
Fort Greely	5.5 tenths of sky cover (January)

During the coldest months, cloudiness is greatest in the maritime areas, particularly over the Pacific coast and the Gulf of St. Lawrence. Inland, cloudiness is less, especially in the north-central area of greatest cold. Widespread areas are analogous to Fort Greely; smaller areas are analogous to less cloudy Fort Churchill. Except for a small area in eastern Maine, the northern United States is too cloudy to be analogous to Fort Churchill.

Greenland presents a different picture. Inland from the coast, cloudiness decreases rather sharply to less than Fort Churchill analogy. Still farther inland, according to the brief records available, cloudiness increases over the high interior of the icecap to values great enough for close analogy with Fort Greely.

f. Mean Snow Depth, Month of Greatest Depth (Fig. 8)

Fort Churchill	25.1 inches (March)
Fort Greely	17.0 inches (February)

Snow depth is so dependent upon a number of other climatic elements that its distribution is highly varied. Mean depths for the month of maximum accumulation range from none along parts of the Oregon-Washington coast to more than 20 feet in the Cascade Mountains a hundred miles to the east. Except for high elevations, only two areas record notably deep snow cover exceeding the limit of Fort Churchill analogy (i.e., more than 30 inches). One is located in central Ontario and the other includes all of Labrador, most of Quebec north of the 50th parallel, and the mountains of eastern Baffin Land.

Fort Churchill analogy occurs in most mountainous regions, except at the highest elevations, and along the southern coast of Greenland. It also appears in two widespread areas over the interior of the continent. One of these reaches from interior Alaska to Great Bear and Great Slave Lakes. The other area stretches from the inland side of Great Slave Lake south and east to the Appalachians and the Gulf of St. Lawrence, skirting Lake Huron and encompassing Hudson Bay.

As a rule, mean snow depths grow shallower on all sides of areas which are analogous to Fort Churchill. These peripheral zones are analogous to Fort Greely.

In Greenland, precipitation patterns over the interior are little known. It might be presumed that snowfall would be relatively light on the interior icecap because of persistent low temperatures. Seasonal snow accumulations in this case should be correspondingly small, as indicated on the map. However, evidence from snow strata measurements made in the central icecap (26) indicates that snowfall there may be greater than shown on Figure 8, which is based upon standard observations. If this is true, the actual area of snow depth analogy on central Greenland may resemble the pattern of cloudiness analogy shown on Figure 7 (i.e., additional areas of analogy on the high interior of the icecap). This information would also modify Figures 9 and 13.

g. Mean Snowfall, Month of Greatest Snowfall (Fig. 9)

Fort Churchill	10.3 inches (November)
Fort Greely	7.0 inches (January)

Fort Churchill and Fort Greely have only moderate mean snowfall even during the snowiest months. Analogous conditions prevail in most of the lowland and high prairie country of western Canada and eastern Alaska, as well as littorals in most of Greenland, western Alaska, and British Columbia. On the other hand, most of eastern Canada, the Rocky Mountains, and the western interior of Alaska have substantially heavier snowfall than either Fort Greely or Fort Churchill.

Much of north-central Canada has relatively light snowfall and is analogous to Fort Greely but not to the slightly snowier Fort Churchill. Relatively light snowfall is also characteristic of parts of the semi-arid western Great Plains and intermontane plateaus of the United States and Canada.

It is difficult to generalize about Greenland because of the scarcity of data. (See closing paragraph, subsection "f," above)

h. Mean Temperature, Warmest Month (Fig. 10)

Fort Churchill	54°F (July)
Fort Greely	59°F (July)

Mean temperatures for the warmest month range from over 75°F in northern United States to below 10°F in central Greenland. The warmest month is generally July in interior and far northern areas, and August near the coasts south of 60° North latitude. Also, a broad salient extending west of Hudson Bay to Great Slave Lake is warmest in August.

Mean warmest month temperatures analogous to those of Fort Greely occur in a broad belt across Alaska and Canada and in the British Isles, mostly north of the 45th parallel. The area of Fort Churchill analogy lies north of the 50th parallel except at high elevations and in limited coastal areas, where it extends farther south. It is limited on the north by cold coasts from the Bering Strait in Alaska to the Hudson Strait in Quebec and Labrador. None of the Arctic Archipelago is warm enough for analogy.

Most of Iceland and the heads of fiords in southwest Greenland are analogous to Fort Churchill alone. The icecaps and north coasts of the two islands are too cold for analogy.

i. Mean Daily Maximum Temperature, Warmest Month (Fig. 11)

Fort Churchill	64°F (July)
Fort Greely	69°F (July)

This map presents essentially the same picture as the mean warmest month temperature map (Fig. 10), except that the southern limits do not extend as far south. The most striking departure from Figure 10 is the presence of an area too warm for analogy to either test site. This area extends from the Central Lowlands of the United States to the Mackenzie Valley on the Northwest Territories.

In contrast to North America, a greater area of the British Isles is analogous to Fort Churchill in mean daily maximum than in mean temperature during the warmest month.

j. Absolute Maximum Temperature

Fort Churchill	96°F (July)
Fort Greely	90°F (May)

No map has been prepared for absolute maxima because these temperatures are not considered to be critical in evaluating arctic and subarctic environments. Table VI contains selected data for this element.

Northwest and central parts of the Arctic Archipelago and the southeast coast of Baffin Island report maximum temperatures below 60°F. Interior Alaska near the Yukon border, on the other hand, has registered 100°F, and temperatures above 120°F have been recorded in central North Dakota.

A 10-degree range of close analogy for Fort Churchill, 91° to 101°F, includes most of the Canadian Maritime Provinces and New England, most of Quebec, Ontario, Manitoba, northern Saskatchewan, Yukon Territory, central Alaska, and British Columbia. The interior plateaus of British Columbia have absolute maxima too hot for Fort Churchill analogy.

Fort Greely analogy, 85° to 95°F, overlaps the Fort Churchill range and extends farther coastward everywhere and up into the mountains in the higher ranges of Alaska and the Yukon Territory.

Records for the interior of the Greenland icecap indicate that maximum temperatures seldom, if ever, rise above the freezing point, but in coastal Greenland they range between 50° and 75°F even on the northern littoral.

k. Mean Cloudiness, Warmest Month (Fig. 12)

Fort Churchill	6.4 tenths of sky cover (July)
Fort Greely	6.4 tenths of sky cover (July)

This map is unique in the series in that the cloudiness values and ranges of analogy for both sites are identical; therefore, analogy is shown by the green tint indicating 100 percent overlap. Cloudiest skies in summer are found over the Aleutian Islands, the Arctic Archipelago westward along the cold coasts to the Bering Sea, the coasts north and east of the Gulf of Alaska, central Quebec and Labrador, and interior high valleys of central British Columbia. Least sky cover occurs over interior United States, the southern part of the Prairie Provinces, and interior lowlands from Alberta to the Yukon Valley in Alaska.

The area of analogy stretches, with few exceptions, from coast to coast and north-south from the Arctic Ocean to northern United States.

The general cloudiness pattern in Greenland for the coldest month, as shown in Figure 7, is repeated in the warmest month. Cloud cover decreases rapidly inland from analogy on the coasts to below analogy and increases again to analogous and greater semi-analogous amounts over the central plateau. The central plateau of Greenland and the west coast of Iceland fall within the analogous range, as do all of the British Isles except the cloudier parts of northern Scotland and western Ireland.

1. Mean Annual Precipitation (Fig. 13)

Fort Churchill	14.4 inches
Fort Greely	11.4 inches

The lowlands of western Canada and central Alaska, parts of the Rockies, the Hudson Bay - Baffin Island areas, and interior Iceland are characterized by rather low precipitation such as occurs in Fort Churchill and Fort Greely. Southeast Canada, the Pacific coast and adjacent ranges, and the south coast of Greenland are much wetter than the two referenced stations.

At the other extreme are the northern parts of Canada, Alaska, and Greenland, with much less precipitation than Fort Greely and Fort Churchill.

Areas analogous only to Fort Churchill occupy the wetter margins of analogy on the map, while those analogous only to Fort Greely occupy the drier margins.

Precipitation in North America is commonly associated with cyclonic activity. Maximum precipitation falls in summer throughout the northern and central regions, from interior Alaska to interior Greenland, including both Fort Churchill and Fort Greely. The maximum occurs in autumn (usually October) along the Gulf of Alaska, Baffin Bay, the St. Lawrence Valley, and east shore of Hudson Bay. In Iceland, the British Isles, and southern and northeastern Greenland, the precipitation maximum occurs a little later in the season, usually November. Winter precipitation maxima prevail in the northwest states, British Columbia, and the Canadian Maritime provinces, but in the east, maxima occur about a month later than in the west.

There is a spring rainfall maximum in a narrow belt of the Rocky Mountain foothills in Alberta. The Great Lakes Region has two peaks of precipitation, the first occurring in May or June and the second in September. Inland New England and the intermontane plateaus of western Canada have a relatively even distribution of precipitation throughout the year.

Data were unavailable for the interior of Greenland (see closing paragraph subsection "f." above).

m. Humidity

Maps of mean dewpoint are not included in this series since dewpoint temperatures, particularly during winter, are generally not much lower than dry bulb temperatures throughout most of the study area. Table XIII shows mean relative humidity at selected stations. No data were available for Fort Greely. Fairbanks, 100 miles west-northwest, has been substituted to provide an approximation of the conditions at Fort Greely.

In winter, mean dewpoint temperatures in most places in the Arctic and Subarctic are about 2 to 5F° below the mean dry-bulb temperatures. The difference is only slightly greater in the prairies of northern United States. During the warmest month, dewpoints average about 10F° lower than mean temperatures in continental locations and only about 2 to 5F° lower in coastal areas. Many arctic and subarctic areas have low absolute humidity, but very high relative humidity during the cold months (e.g., Fort Churchill and Aklavik). Certain marine stations in the northwest have lower relative humidity in winter than in summer (e.g., Barrow and Nome). However, in lower latitudes there is a tendency for relative humidity to be higher in winter than in summer (e.g., Vancouver, B.C. and Gander, Newfoundland). In extremely cold areas of the Arctic it is not uncommon for relative humidity to exceed 100 percent, with resulting condensation producing a diffuse ice fog.

n. Mean Number of Days with Fog (Fig. 13A)

Fort Churchill	13 days per annum
Fort Greely	8 days per annum

Figure 13A and Table XIV show mean frequency of days with fog wherein visibility is restricted to about one mile or less. Data for only dense fog (visibility 1/4 mile or less) were available for most stations in the United States and certain interior stations in Alaska. A comparison with nearby stations in similar situations indicates that the total frequency of occurrence of fog for these Alaskan stations would not be appreciably different from that for dense fog alone, so the data are undifferentiated on the map. In the United States, comparison of data did not indicate a similar relationship, and fog was therefore not mapped for the United States.

Radiation fogs resulting from radiative cooling near the ground are the most widespread type in the study area. Such fogs occur most frequently at temperatures of -40°F or colder, in the form of ice fogs. This phenomenon is rather common during cold months in the Arctic. Ice fog and accompanying smoke fog from motor exhaust often obscure the immediate

vicinity of landing fields for several hours following a few successive aircraft landings or take-offs. Ice fog for the month of maximum occurrence (February) averages 108 hours at Fort Churchill while at Fort Greely the maximum monthly average is about 57 hours in January.

Summer is the season of greatest fog frequency along most arctic and subarctic coasts from Alaska to Iceland and as far south as the Queen Charlotte Islands on the Pacific Coast and Nova Scotia on the Atlantic Coast. However, along the poleward shores of the Arctic Archipelago from a point east of Herschel Island, Yukon, to northern Greenland, autumn is the season with the greatest mean number of days with fog. Summer is the foggiest season along the eastern flanks of the Alberta Rockies, in the Great Lakes Region, and on the southern coasts of the British Isles.

Throughout a broad inland area from the Tanana Valley and Brooks Range of Alaska south to Oregon and southeast along the margin of the Canadian Shield to the St. Lawrence Valley, fog is most frequent in autumn. Autumn is also foggiest on the icecap in southern Greenland and the highlands of Iceland. Winter is the foggiest season in most of the central Alaskan and Yukon valleys and plateau country, high plains and plateaus of British Columbia, the Prairie Provinces, northern Plains States, the upper St. Lawrence and Ottawa River basins, central Greenland, and most of the British Isles.

Localities with spring fog maxima are less extensive and less numerous. Notable among these smaller areas are the Foxe Basin, northern Ontario, central Quebec, southern shores of the Gulf of St. Lawrence, and parts of the north and east coasts of Greenland.

The map shows areas having very high and very low fog frequency. Those with very high fog occurrence (60 days or more per year) are likely to fall in one of three classifications. The most widespread of these is the high elevation type where the normal cloud cover is frequently low enough to obscure the mountains. Highest parts of the western ranges, the Baffin highlands, and high icecaps of Ellesmere Island, Greenland, and Iceland belong to this category.

The second type occurs mainly in scattered coastal situations where summer sea fogs predominate. Notable examples of this type are found in northern and western Alaska, east Greenland, and parts of the Canadian Maritime Provinces.

The third type of locality having frequent fog is found in the vicinity of major settlements in very cold areas where combustion of large quantities of fuel in winter produces numerous condensation nuclei. This condition accounts for relatively frequent ice fogs around a townsite, although a few miles away a very low fog frequency may prevail.

Areas of very low annual fog incidence are found at relatively low elevations in interior locations. The interior valleys of Alaska, the valleys, plains, and low shield country of central Canada, heads of fiords in Greenland. and north and west coasts of Scotland and Ireland have less than 10 days of fog per year. Fort Greely, with 8 days, falls within this frequency range and Fort Churchill, with 13 days, is only slightly foggier.

5. Analysis of composite maps

Figures 14 through 16 synthesize several of the foregoing maps to show analogous areas of coincidence among multiple climatic elements. Temperatures were chosen to serve for the basic zones of analogy. These zones were called: (a) "winter temperature analogy", the areal coincidence of mean and mean daily minimum temperatures for the coldest month. and (b) 'summer temperature analogy", the areal coincidence of mean and mean daily maximum temperatures for the warmest month. Over these basic analogous zones were superimposed analogous areas of additional stress elements (i.e., snow depth, windchill, and precipitation) in various combinations. Certain lines were generalized.

a. Composite Analogous Areas, Coldest Month (Fig. 14)

Because the ranges of coldest month temperature analogy for the two test sites do not overlap, it was possible to draw the coldest month composite for both sites on the same map. Areas of analogous snow depth and windchill were placed over the winter temperature analogy for both Fort Greely and Fort Churchill. Yellow indicates Fort Greely and blue indicates Fort Churchill temperature analogy, with black line patterns designating snow depth and windchill analogy for both sites.

Zones that are completely analogous (with respect to temperature, snow depth, and windchill) to the respective test sites are small and widely dispersed. For Fort Churchill, the most extensive area is in the vicinity of the site itself, on both sides of Hudson Bay. Other patches at the entrance to Foxe Basin, east of Coppermine, and on the southern Greenland icecap, are less reliably defined, since they do not include stations for corroboration.

Complete analogy for Fort Greely is narrowly confined to the immediate vicinity of Fort Greely, northwestern Alaska, the south end of Lake Winnipeg, and scattered patches bordering the icecap of southern Greenland. The combination of temperature and snow depth analogy is most widespread in the western half of the continent; coincidence of temperature and windchill analogies is more common in the east.

b. Composite Analogous Areas, Fort Greely (Fig. 15)

Seasonal and year-round analogies are shown in Figure 15. Areas of analogous winter and summer temperatures are represented in blue and yellow diagonal lines respectively. Overlaps of the two give the appearance of a green pattern. Areas of analogous mean annual precipitation are shown by black stipple pattern, only where analogous temperatures occur.

Combined analogy (winter and summer temperatures and precipitation) for Fort Greely occurs in three areas: (1) adjacent to Fort Greely along the north flank of the Alaska Range and southward through Broad Pass into the Gulkana Basin, (2) a small patch straddling the lower Yukon River south of its confluence with the Koyakuk, and (3) the largest of the three areas, southern Yukon Territory.

The most widespread area of temperature-precipitation analogy occurs in summer. It includes central Alaska and most of the Yukon Territory stretching southeastward in a broad band through the larger Canadian lakes to Hudson Bay and northern Ontario. Other isolated spots are found primarily in high valleys from Alaska's Gulkana Basin to the state of Wyoming.

Combined winter and summer temperature analogy appears in parts of lowland Alaska, plateau valleys of northern British Columbia and southern Yukon, scattered Canadian prairie locations near lakes, and in a sizable portion of the Laurentian Upland stretching from central Ontario to southern Labrador.

Analogous areas of precipitation in combination with winter temperatures occur in widely-dispersed, small spots from Alaska to the Greenland icecap.

c. Composite Analogous Areas, Fort Churchill (Fig. 16)

This map was prepared in the same manner as Figure 15. Combined winter and summer temperature and precipitation analogy for Fort Churchill occurs in only three locations. The principal area extends east from northern Saskatchewan to include the west shore of Hudson Bay from James Bay nearly to Chesterfield Inlet. The other locations (but with no verifying stations) are the central Ungava Peninsula of northern Quebec, and the lowland just west of Great Bear Lake.

Summer temperatures and precipitation are jointly analogous in the interior plateau valleys of northern British Columbia and southern Yukon, the western lowlands of Alaska, and other scattered small areas.

Analogy of combined winter temperatures and precipitation occurs in a narrow strip from central Yukon to northern Manitoba and along the northeast shores of Hudson Bay and southeastern Baffin Island.

Combined summer and winter temperatures are analogous in parts of the Brooks Range of Alaska, in a broad swath stretching from the Mackenzie Delta along the eastern shores of the larger lakes of the Shield margin to northern Saskatchewan and in a large part of the Laurentian Upland of north-central Quebec.

6. Tables of monthly climatic values for selected stations

Table I is a list of stations with elevations and map coordinates for which climatic data are presented in the subsequent tables.

Tables II through XIII show mean values of climatic elements for all months for forty of the stations selected from Table I to illustrate comparative climatic regimes among representative parts of the study area. These elements are the same as used in the map series with the addition of Table VI, Absolute Maximum Temperature and Table XIII, Mean Relative Humidity.

Table XIV is a frequency table showing Mean Number of Days with fog. Some stations (as indicated) show only dense fog, although most figures represent fogs of all densities affording less than about 1 mile horizontal surface visibility

While the maps were prepared on a seasonal basis for warmest or coldest months (except Fig. 13 and Fig. 17) the tables provide information for making year-round regional comparisons.

7. Limitations of methods

The following limiting factors may affect the reliability of the accompanying maps.

(a) Many parts of the study area have few or no climatic stations. There are practically no representative data for most zones of high elevation, such as the Alaskan and western Cordilleran ranges and the icecapped highlands of Ellesmere Island, Baffin Island, and Iceland.

(b) Many far northern stations have very short periods of record, many obtained 30 to 50 years ago It was not possible to obtain data from comparable periods of record in every case.

(c) The map analyses necessitated broad comparisons between large, diverse areas and two localized climatic stations.

(d) Times and frequencies of daily meteorological observations vary from one locality or political unit to another.

(e) Station exposure and elevation are not always representative of very large surrounding areas for which inferences had to be made.

Table I: LOCATION AND ELEVATION OF STATIONS

Country (Area)	Climatic Station	Elevation (feet)	Lat. (N) (°)	(')	Long. (W) (°)	(')
Alaska	Barrow	22	71	18	156	47
	Bethel	10	60	47	161	43
	Dutch Harbor	72	53	53	166	32
	Fairbanks	440	64	51	147	43
	FORT GREELY	1,274	64	00	145	44
	Juneau	72	58	18	134	24
	Kodiak	21	57	45	152	31
	Nome	13	64	30	165	26
British Isles	London (Kew), England	18	51	28	0	19
	Stornoway, Hebrides	79	58	11	6	21
Canada	Calgary, Alta.	3,540	51	02	114	01
(Western	Embarras, Alta.	775	58	12	111	23
Provinces)	FORT CHURCHILL, MAN.	115	58	47	94	17
	Fort Vermilion, Alta.	950	58	23	116	03
	Keg River, Alta.	1,402	57	47	117	50
	Prince George, B. C.	2,218	53	54	122	40
	The Pas, Man.	890	53	49	101	15
	Vancouver, B. C.	45	49	17	123	05
(Eastern	Charlottetown, P. E. I.	186	46	14	63	07
Provinces)	Gander, Nfld.	582	48	57	54	34
	Goose Bay (Lab.), Nfld.	144	53	20	60	25
	Kapuskasing, Ont.	752	49	25	82	28
	Lake Doré (Chibougamau), Que.	1,234	49	54	74	18
	Moose Factory, Ont.	29	51	14	80	31
	Moosonee, Ont.	34	51	16	80	39
	Nitchequon, Que.	1,690	53	12	70	
	Port Harrison, Que.	66	58	27	78	08
	Quebec, Que.	296	46	48	71	13
	Sioux Lookout, Ont.	1,227	50	07	91	54
(Yukon & N.W.	Akluvik, Mackenzie	30	68	14	135	00
Territories)	Alert, Franklin	205	82	30	62	20
	Arctic Bay, Franklin	36	73	00	85	18
	Baker Lake, Keewatin	30	64	18	96	05
	Coppermine, Mackenzie	13	67	47	115	15
	Dawson, Yukon	1,062	64	04	139	29
	Fort Simpson, Mackenzie	415	61	52	121	21
	Mould Bay, Franklin	50	76	17	119	28
	Resolution Island, Franklin	127	61	18	64	53
Greenland	Jakobshavn	102	69	13	51	02
	Myggbukta	10	73	29	21	34
	Nanortalik	23	60	10	45	17
	Narsarssuak	88	61	11	45	25
	Scoresbysund	56	70	29	21	58
	Søndre Strømfjord	187	67	00	50	48
	Thule	121	76	33	68	49
Iceland	Reykjavik	131	63	49	22	43
U. S. A.	Devils Lake, N. D.	1,471	48	07	98	52
	Helena, Mont.	3,893	46	36	112	00
	Sault Ste. Marie, Mich.	721	46	28	84	22

TABLE II. MEAN TEMPERATURE (°F)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	30	-15	-18	-15	0	19	34	40	38	31	17	1	-10	10
Bethel	30	7	9	12	27	40	53	55	53	45	32	17	7	30
Dutch Harbor	25	32	32	34	36	41	46	51	53	49	42	36	33	40
FORT GREELY	9	-5	2	12	28	46	56	59	54	44	27	5	-4	27
Juneau	45	28	30	34	41	48	54	56	55	50	43	36	31	42
Kodiak	38	30	32	33	37	43	50	54	55	50	42	35	31	41
Nome	14	3	6	9	20	34	46	50	49	42	29	16	8	26
London British Isles	34	41	41	43	47	55	60	63	62	58	51	44	41	50
Stornoway	52	40	40	41	44	48	52	55	55	52	47	43	40	46
Calgary Canada (West)	59	13	17	26	40	50	56	62	60	51	42	28	19	38
FORT CHURCHILL	30	-19	-17	-6	14	30	43	54	52	42	27	6	-11	18
Fort Vermilion	30	-9	-4	11	32	49	57	62	58	43	34	11	-5	29
Prince George	27	13	18	30	40	49	56	60	59	50	41	29	16	38
The Pas	39	-9	-2	11	33	48	59	65	61	49	35	17	1	31
Vancouver	41	36	39	43	48	54	60	64	63	57	50	43	39	49
Charlottetown (East)	65	18	17	26	36	48	58	68	65	58	48	36	25	42
Gander	14	19	18	24	33	44	52	62	61	54	44	34	25	39
Goose Bay	10	0	4	16	28	40	51	61	58	50	38	24	9	32
Moose Factory	40	-6	-3	10	27	41	54	61	59	50	38	21	4	30
Pitchequon	10	-11	-6	6	21	36	49	58	55	45	34	17	-1	25
Port Harrison	26	-15	-16	-6	11	28	39	47	47	41	31	17	-1	19
Quebec	72	10	12	23	37	51	62	67	64	56	44	30	16	39
Sioux Lookout	23	-3	2	15	32	48	59	65	62	52	38	21	3	33
Aklavik (Territories)	25	-18	-17	-9	9	31	49	56	50	38	20	-3	-17	16
Alert	6	-28	-29	-27	-8	11	32	32	33	16	-3	-15	-23	-1
Arctic Bay	13	-21	-26	-16	-4	19	36	43	41	29	14	-4	-16	8
Baker Lake	6	-30	-32	-15	-1	19	34	48	49	38	20	-2	-16	9
Coppermine	30	-19	-20	-14	1	22	39	49	47	36	19	-4	-16	12
Dawson	53	-29	-11	5	29	46	57	60	55	43	26	1	-13	23
Fort Simpson	42	-18	-11	1	26	45	56	62	57	46	29	4	-12	24
Mould Bay	8	-30	-33	-25	-8	13	31	38	34	20	2	-15	-26	1
Resolution Island	22	0	-1	7	15	27	34	37	38	35	29	21	8	21
Jakobshavn Greenland	52	0	-3	3	15	31	40	46	44	35	25	17	9	22
Nanortalik	42	23	23	26	31	37	41	43	42	39	35	29	25	33
Scoresbysund	12	4	4	5	14	27	37	42	39	34	20	14	9	21
Thule	6	-11	-15	-12	-2	22	36	41	38	27	14	5	-10	11
Reykjavik Iceland	48	30	30	31	36	43	49	52	50	46	39	34	30	39
Devils Lake U.S.A.	47	3	7	22	39	52	62	68	66	56	43	25	10	38
Helena	73	20	24	32	44	52	60	68	66	56	46	33	25	44
Sault Ste. Marie	64	15	13	23	38	49	59	64	63	56	45	32	21	40

*Values for coldest and warmest months are underlined.

TABLE III. MEAN DAILY MINIMUM TEMPERATURE (°F)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	25-28	-23	-24	-22	-8	14	29	34	33	27	12	-6	-18	4
Bethel	17-18	-1	0	3	18	31	43	46	45	38	24	11	0	21
Dutch Harbor	22-24	23	27	28	31	35	39	45	46	43	37	32	29	35
FORT GREELY	9	-13	-7	1	18	36	46	49	44	36	20	-2	-13	18
Juneau	43-47	24	26	29	34	40	46	50	49	45	39	31	27	37
Kodiak	20-22	26	27	28	32	37	44	47	48	44	38	31	28	36
Nome	34-35	-4	-2	1	12	28	38	44	43	36	24	10	1	20
London British Isles	34	36	35	37	40	46	51	55	54	50	44	39	37	44
Stornoway	52	36	35	35	38	42	47	49	50	47	42	39	36	41
Calgary Canada (West)	59	2	6	14	27	36	43	47	45	37	29	17	9	26
FORT CHURCHILL	30	-27	-25	-16	4	22	34	43	43	34	20	-2	-19	9
Fort Vermillon	30	-19	-16	-3	19	36	44	49	45	35	24	3	-14	17
Prince George	27	3	6	18	27	34	42	44	43	36	30	21	8	26
The Pas	39	-18	-13	-2	21	36	48	54	50	38	26	8	-8	20
Vancouver	41	32	33	36	40	46	50	54	53	49	44	38	35	43
Charlottetown (East)	65	10	9	19	30	39	50	58	58	51	41	31	18	34
Gander	14	12	11	17	26	35	43	52	52	46	37	28	19	32
Goose Bay	10	-8	-5	6	19	32	42	52	49	42	31	18	2	23
Moose Factory	40	-18	-15	-4	15	30	42	49	48	40	30	14	-5	19
Mitchequon	10	-21	-18	-6	10	27	40	48	47	39	28	11	-9	16
Port Harrison	26	-22	-24	-14	3	22	32	39	40	36	26	12	-8	12
Quebec	72	2	4	15	29	41	52	57	54	48	37	24	9	31
Sioux Lookout	23	-11	-9	4	23	37	48	54	51	43	32	16	-4	24
Aklavik (Territories)	22	-26	-24	-17	-2	22	40	47	42	32	15	-9	-24	8
Alert	5	-35	-37	-36	-17	7	27	33	29	11	-10	-21	-30	-7
Arctic Bay	13	-28	-33	-25	-14	12	30	36	35	25	9	-10	-22	1
Baker Lake	6	-40	-35	-19	-11	10	27	38	40	30	7	-13	-23	1
Coppermine	30	-26	-28	-22	-8	15	32	42	40	31	14	-12	-23	5
Dawson	53	-26	-19	-6	16	34	43	47	42	33	20	-4	-19	13
Fort Simpson	42	-27	-21	-11	14	33	45	50	46	36	21	-3	-20	14
Mould Bay	7	-37	-39	-32	-15	8	27	34	30	16	-6	-21	-32	-6
Resolution Island	19	-6	-6	2	10	23	30	33	34	32	26	18	4	17
Jakobshavn Greenland	50	-7	-10	-5	6	25	35	40	38	30	20	11	4	16
Nanortalik	47	17	15	17	25	33	36	40	39	35	30	24	17	27
Scoresbysund	12	-3	-5	-4	6	20	31	36	33	29	15	7	2	14
Thule	6	-20	-23	-21	-11	16	30	36	33	21	6	-3	-17	3
Reykjavik Iceland	11	27	30	30	33	38	44	47	46	40	35	30	29	26
Devils Lake U. S. A.	47	-6	-2	13	29	40	51	56	53	44	32	17	2	27
Helena	73	11	15	23	33	41	48	54	53	44	35	24	16	33
Sault Ste. Marie	64	7	4	14	29	39	48	53	53	47	38	27	14	31

*Values for coldest month are underlined.

TABLE IV. MEAN DAILY MAXIMUM TEMPERATURE (°F)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	25-29	-10	-11	-7	8	25	40	47	44	35	22	6	-5	16
Bethel	16-16	16	17	22	36	50	63	53	61	53	38	24	15	38
Dutch Harbor	22-24	37	36	39	41	46	52	58	59	54	47	41	38	46
FORT GREELY	9	3	11	23	38	56	66	69	63	52	34	13	4	36
Juneau	44-48	32	35	39	47	55	62	64	62	56	48	40	35	48
Kodiak	20-22	35	37	39	43	48	56	60	60	56	48	40	33	46
Nome	33-35	11	13	17	27	41	53	56	55	48	35	21	14	32
London British Isles	34	45	46	50	54	63	68	71	70	65	58	49	46	57
Stornoway	52	44	44	46	49	54	58	60	60	58	52	48	45	51
Calgary Canada (West)	59	24	28	37	53	63	69	76	74	64	54	38	29	51
FORT CHURCHILL	30	-11	-8	4	24	38	52	64	62	49	34	13	-3	26
Fort Vermilion	30	2	8	25	45	62	70	76	72	60	44	20	5	41
Prince George	27	23	31	42	54	64	70	75	74	65	52	38	25	51
The Pas	39	1	10	24	45	60	70	76	72	60	45	25	9	41
Vancouver	41	40	44	50	57	63	69	74	72	66	56	48	42	57
Charlottetown (East)	65	26	26	33	43	56	66	73	72	65	54	42	31	49
Gander	14	26	26	31	40	53	62	72	70	62	51	40	31	47
Goose Bay	10	8	14	25	37	49	61	71	67	59	45	31	16	40
Moose Factory	40	6	10	23	38	52	67	73	70	61	47	29	14	41
Nitchequon	20	0	5	18	32	44	58	65	62	52	40	23	7	34
Port Harrison	26	-8	-9	3	20	34	46	54	54	46	36	23	6	25
Quebec	72	18	20	31	44	61	72	76	73	64	51	36	22	47
Sioux Lookout	23	5	13	26	43	60	69	76	72	60	45	27	10	42
Aklavik (Territories)	22	-10	-9	0	19	40	58	66	58	44	25	3	-8	24
Alert	5	-20	-22	-20	-1	20	37	44	38	21	3	-8	-16	6
Arctic Bay	13	-14	-19	-8	5	27	42	51	47	34	19	1	-9	15
Baker Lake	6	-23	-26	-8	6	27	40	57	59	43	26	6	-10	16
Coppermine	30	-11	-13	-6	10	29	45	57	53	41	25	3	-9	19
Dawson	53	-12	-4	17	42	59	70	73	68	53	33	7	-7	33
Fort Simpson	42	-10	0	13	38	56	68	74	68	56	36	11	-4	34
Mould Bay	7	-23	-27	-17	1	19	36	43	38	25	7	-8	-19	6
Resolution Island	19	5	4	12	20	30	37	42	42	38	32	25	14	25
Jakobshavn Greenland	32	8	6	14	24	38	46	51	50	41	31	22	15	29
Nanortalik	47	35	38	36	38	42	47	47	48	44	40	35	34	40
Scoresbysund	12	12	12	14	22	32	43	49	45	39	25	20	16	27
Thule	6	-2	-7	-3	8	20	41	46	44	34	21	13	-2	18
Reykjavik Iceland	11	36	39	39	43	45	54	57	55	49	43	39	38	45
Devils Lake U. S. A.	47	13	17	32	51	64	73	81	79	68	54	34	20	49
Helena	73	28	32	42	55	63	71	81	80	68	56	42	33	54
Sault Ste. Marie	64	22	22	32	46	59	70	75	72	65	52	38	27	48

*Values for warmest months are underlined.

TABLE V. ABSOLUTE MINIMUM TEMPERATURE (°F)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	35	-53	-56	-52	-42	-18	8	22	20	4	-19	-40	-55	-56
Bethel	32	-52	-45	-36	-25	-5	28	30		18	-5	-31	-44	-52
Dutch Harbor	17-25	10	5	9	13	20	30	36		29	12	16	10	5
FORT GREELY	9	-65	-60	-39	-37	-1	32	35	42	9	-15	-42	-62	-65
Juneau	50	-15	-15	-5	13	24	33	38	36	29	13	-1	-21	-21
Kodiak	42-49	-9	-3	2	5	20			34	26	7	-3	-12	-12
Nome	39	-47	-42	-38	-30	-11		3	24	16	-4	-39	-42	-47
London British Isles	65	9	11	17	26	30	37	43	41	31	25	20	11	9
Stornoway	52	11	12	13	16	26	31	32	33	32	28	20	12	11
Calgary Canada (West)	59	-48	-49	-34	-14	12	26	31	28	8	-8	-31	-45	-49
FORT CHURCHILL	61	-57	-52	-52	-26	-14	13	22	25	15	-17	-53	-47	-57
Fort Vermilion	32	-78	-66	-52	-38	-20	18	26	22	6	-21	-44	-72	-78
Prince George	30	-58	-52	-31	-12	15	24	29	25	6	-4	-39	-56	-58
The Pas	39	-54	-54	-43	-21	13	25	32	22	16	-11	-33	-51	-54
Vancouver	40	2	8	15	27	33	36	43	39	30	21	10	8	2
Charlottetown (East)	30	-27	-23	-12	8	22	32	42	40	32	23	5	-17	-27
Gander	14	-13	-16	-14	7	22	28	36	30	31	22	6	-5	-16
Goose Bay	9	-32	-35	-32	-13	10	30	38	32	20	11	-9	-25	-35
Moose Factory	40	-56	-48	-48	-29	0	23	30	29	20	-3	-27	-41	-56
Mitchequon	9	-56	-55	-49	-31	-8	23	33	34	25	1	-25	-52	-56
Port Harrison	29	-51	-57	-49	-26	-5	15	20	28	12	-9	-29	-46	-57
Quebec	31	-34	-28	-20	0	19	34	43	43	30	18	-6	-32	-34
Sioux Lookout	15	-46	-50	-36	-22	14	27	37	32	23	12	-22	-39	-50
Aklavik (Territories)	25	-56	-62	-50	-44	-14	20	30	25	12	-22	-50	-54	-62
Alert	6	-54	-53	-53	-50	-16	12	22	5	-12	-32	-39	-51	-54
Arctic Bay	8-13	-52	-57	-49	-37	-14	11	22	24	9	-12	-42	-41	-57
Baker Lake	6	-57	-58	-53	-33	-9	14	27	28	18	-14	-34	-47	-58
Coppermine	30	-54	-58	-56	-45	-24	5	31	27	7	-28	-42	-49	-58
Dawson	53	-68	-73	-50	-41	9	25	29	17	9	-23	-50	-63	-73
Fort Simpson	52	-66	-69	-52	-37	-9	25	31	21	7	-18	-41	-64	-69
Mould Bay	8	-55	-58	-56	-38	-18	11	25	13	-13	-26	-46	-63	-63
Resolution Island	19	-36	-32	-22	-20	-2	16	26	26	14	6	-10	-22	-36
Jakobshavn Greenland	58	-45	-46	-42	-35	-10	21	28	24	8	-6	-18	-34	-46
Nanortalik	32	-6	-5	-5	8	20	28	31	29	22	16	8	-1	-6
Scoresbysund	12	-37	-38	-42	-30	1	22	28	26	10	-13	-27	-38	-42
Thule	6	-39	-47	-43	-32	-9	18	27	20	4	-20	-28	-36	-47
Reykjavik Iceland	11	6	8	8	13	24	33	39	34	27	18	10	13	6
Devils Lake U. S. A.	47	-44	-46	-32	-4	6	29	37	31	15	-1	-21	-37	-46
Helena	73	-42	-41	-26	-10	22	31	36	29	6	-8	-22	-40	-42
Sault Ste. Marie	64	-32	-37	-27	-13	21	31	36	32	25	15	-12	-24	-37

*Lowest value for period of record are underlined.

TABLE VI. ABSOLUTE MAXIMUM TEMPERATURE (°F)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	35	33	31	30	42	45	70	78	73	61	43	39	34	78
Bethel	32	49	51	53	59	76	90	86	84	76	65	60	49	90
Dutch Harbor	22-26	56	60	69	61	66	73	79	80	80	65	58	56	80
FORT GREELY	9	46	51	51	62	90	86	85	82	73	62	50	48	90
Juneau	43-47	54	57	61	69	80	87	89	87	77	66	64	59	89
Kodiak	34-40	53	60	65	62	74	82	82	85	77	66	60	61	85
Nome	39	46	47	44	60	66	80	84	80	65	59	50	40	84
London British Isles	65	57	62	68	80	87	88	90	94	92	83	63	59	94
Stornoway	52	55	55	59	67	75	78	76	75	77	70	58	56	78
Calgary Canada (West)	59	61	76	75	85	90	95	97	96	90	85	71	67	97
FORT CHURCHILL	61	39	31	41	62	87	38	96	90	84	65	45	34	96
Fort Vermilion	30	52	55	62	76	92	90	101	94	89	81	61	50	101
Prince George	30	54	58	68	86	95	93	102	96	92	84	62	54	102
The Pas	39	44	56	59	87	93	93	100	96	90	80	58	48	100
Vancouver	40	59	61	68	79	83	92	91	92	86	77	63	60	92
Charlottetown (East)	30	53	53	60	80	83	88	92	98	88	82	67	61	98
Gander	14	50	53	53	71	78	91	91	89	84	76	67	53	91
Goose Bay	9	42	46	51	62	89	89	100	91	84	73	58	53	100
Moose Factory	33	43	44	61	75	95	96	97	96	91	84	64	50	97
Mitchequon	9	33	34	44	52	79	90	88	84	79	66	45	41	90
Port Harrison	25	33	41	38	44	74	78	80	75	73	62	43	35	80
Quebec	30	52	47	64	80	89	94	96	95	87	82	71	55	96
Sicux Lookout	15	44	48	66	87	88	95	94	96	89	78	58	48	96
Aklavik (Territories)	25	44	49	45	56	77	86	93	88	76	55	44	46	93
Alert	6	10	24	9	30	46	57	64	59	39	33	31	13	64
Arctic Bay	8-12	28	36	27	34	51	63	75	64	56	44	23	34	75
Baker Lake	6	10	6	25	31	42	63	80	82	66	43	36	24	82
Coppermine	30	21	34	29	46	78	82	87	83	72	57	36	37	87
Dawson	53	36	48	52	69	85	95	98	88	79	68	52	55	98
Fort Simpson	52	53	60	54	71	95	95	94	93	86	87	54	45	95
Mould Bay	8	10	-5	11	29	35	56	59	57	38	24	19	9	59
Resolution Island	19	34	34	37	39	45	58	59	61	60	43	38	35	61
Jakobshavn Greenland	38	59	49	51	55	62	67	71	66	58	58	54	52	71
Nanortalik	31	52	53	48	59	62	68	66	67	64	59	57	54	68
Scoresbysund	12	48	41	47	45	49	60	63	55	62	47	52	40	63
Thule	6	36	36	34	41	46	59	62	57	49	40	38	34	62
Reykjavik Iceland	11	49	48	51	58	60	64	69	64	61	56	52	49	69
Devils Lake U. S. A.	47	51	56	85	87	106	103	112	103	103	89	69	64	112
Helena	73	63	69	73	86	95	102	103	103	96	84	71	64	103
Sault Ste. Marie	64	48	50	75	83	91	93	98	98	92	82	75	54	98

*Highest values for period of record are underlined.

TABLE VII. MEAN SURFACE WIND SPEED (mph)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	28	10.8	11.4	10.8	11.4	11.6	11.3	11.8	12.6	13.3	14.0	12.5	11.0	11.9
Bethel	12	11.0	12.4	11.2	10.6	9.4	9.6	9.1	9.9	9.7	10.2	10.0	10.8	10.3
Dutch Harbor	21	5.4	8.5	13.0	8.9	10.1	10.3	11.2	10.1	11.6	10.5	8.5	8.1	9.7
FORT GREELY	5	17.0	17.0	10.0	9.0	10.0	9.0	8.0	10.0	10.0	13.0	15.0	14.0	11.8
Juneau	12	8.7	8.4	9.0	8.7	7.6	7.4	7.1	7.1	7.6	9.3	7.9	8.8	8.1
Kodiak	7	8.7	9.5	9.5	8.4	8.4	6.1	5.9	6.0	7.9	8.6	8.0	9.9	8.1
Nome	25	10.7	10.7	10.3	10.2	8.9	8.9	9.4	10.2	10.7	10.6	11.0	9.9	10.1
London British Isles	35	8.2	8.7	8.9	8.6	7.8	7.1	6.6	6.7	6.2	6.7	7.6	8.4	7.6
Stornoway	15	10.4	6.9	5.8	6.9	5.8	5.8	4.6	4.6	6.9	6.9	6.9	6.9	6.5
Calgary Canada(West)	18	6.8	6.8	7.6	8.2	8.4	7.8	6.5	5.9	7.1	7.1	6.9	7.3	7.3
FORT CHURCHILL	19	14.9	14.6	14.2	14.3	13.4	12.2	11.5	13.0	16.3	17.1	16.9	14.9	14.4
Keg River	11	5.7	5.5	6.6	7.3	7.6	6.3	6.2	6.1	6.2	6.7	5.4	4.9	6.2
Prince George	8	4.5	3.8	5.0	4.4	4.3	3.6	3.3	3.2	3.3	4.5	4.7	4.3	4.1
The Pas	25	7.7	6.4	6.9	7.6	8.1	7.7	6.7	6.7	7.1	7.3	6.7	6.4	7.1
Vancouver	21	3.7	4.0	4.4	4.5	4.3	4.0	3.8	3.4	3.4	3.3	3.4	4.1	3.9
Charlottetown (East)	24	11.4	10.8	10.8	10.8	9.6	8.9	8.5	8.6	9.4	10.8	10.9	11.6	10.2
Gander	9	16.9	17.7	17.2	15.5	13.9	14.1	12.7	12.2	13.9	15.1	15.5	16.9	15.1
Goose Bay	4	10.7	9.3	10.2	9.7	9.2	8.8	8.9	8.7	9.6	10.7	10.3	10.9	9.8
Moosonee	4-5	7.9	8.6	9.0	9.6	8.9	8.2	7.4	8.2	8.3	8.0	7.9	7.4	8.3
Mitchequon	3	8.5	7.8	7.7	7.5	7.9	6.9	8.6	7.9	9.9	10.4	8.6	9.1	8.4
Port Harrison	8	12.2	12.7	13.8	14.3	14.7	13.2	14.2	13.8	14.9	15.2	17.3	14.4	14.3
Quebec	25	15.0	16.1	15.3	14.4	14.4	13.2	11.6	10.7	11.5	12.4	14.0	13.9	13.5
Sioux Lookout	10	8.1	8.4	9.2	9.5	9.5	9.2	8.2	8.7	9.7	10.1	10.2	9.1	9.2
Aklavik (Territories)	6-8	5.6	6.2	7.9	7.4	7.8	7.7	6.6	6.9	6.5	5.3	4.1	3.4	6.3
Alert	1-2	1.2	1.8	2.3	2.5	5.9	4.9	9.0	6.5	7.4	7.2	3.3	4.2	4.7
Arctic Bay	7	5.4	2.8	3.5	3.5	6.0	8.2	8.8	7.6	8.1	6.2	6.1	3.4	5.6
Baker Lake	1-2	15.3	9.3	9.3	12.9	9.1	8.5	11.8	12.6	12.4	14.1	12.7	14.9	11.9
Coppermine	9	8.3	8.4	6.9	6.7	7.2	5.6	8.2	9.3	9.8	10.3	10.0	8.0	8.3
Dawson	4-6	3.9	2.2	3.8	3.1	3.8	3.6	2.9	3.1	3.4	3.8	4.5	3.6	3.5
Fort Simpson	16	5.8	7.2	8.7	6.7	6.0	6.6	7.2	7.7	6.4	7.2	6.9	6.9	6.9
Mould Bay	3	6.6	10.0	9.3	---	---	12.0	11.0	11.0	13.4	9.6	9.1	5.1	---
Resolution Island	16	18.4	18.1	16.8	16.8	14.4	13.0	12.6	12.9	14.8	17.7	18.9	18.2	16.1
Jakobshavn Greenland	30	8.1	6.8	6.4	5.4	6.4	6.8	4.7	5.5	6.8	8.6	9.6	9.1	7.2
Nanortalik	41	11.8	11.4	10.9	10.0	7.0	9.5	7.0	6.0	8.5	9.0	10.4	10.4	9.5
Scoresbysund	12	4.7	5.4	4.5	3.9	3.2	2.8	2.6	2.6	3.2	3.9	3.9	4.0	3.8
Thule	6	9.4	10.8	8.8	7.7	8.2	8.1	7.3	8.9	9.6	10.4	9.7	8.9	9.0
Reykjavik Iceland	19	14.2	14.2	13.2	11.6	10.6	10.6	9.1	9.1	10.1	11.6	11.6	12.6	11.5
Devils Lake U. S. A.	47	10.0	10.2	10.9	11.4	11.0	9.8	8.6	8.7	9.5	10.1	10.2	9.5	10.0
Helena	73	7.2	7.5	8.3	8.7	8.7	8.4	8.0	7.8	7.8	7.6	7.3	7.2	7.9
Sault Ste Marie	64	9.0	9.1	9.9	9.7	9.0	7.6	7.2	7.1	7.9	8.9	9.9	9.5	8.7

*Values for coldest month are underlined.

TABLE VIII: MEAN WINDCHILL (KgCals/m^2/hr.)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	**Comb'd	1645	1705	1645	1425	1130	890	800	845	970	1210	1440	1570	1280
Bethel	"	1305	1310	1230	985	760	570	530	570	690	900	1125	1300	930
Dutch Harbor	"	770	865	915	810	760	685	620	575	655	750	805	840	745
FORT GREELY	"	1630	1520	1200	930	680	525	455	560	710	1030	1430	1555	1005
Juneau	"	825	890	840	730	610	520	485	500	580	715	790	885	705
Kodiak	"	895	885	870	785	695	550	495	480	585	720	805	905	720
Nome	"	1360	1310	1255	1080	840	665	610	635	755	955	1165	1255	990
London British Isles	"	720	730	710	645	510	430	380	400	445	550	665	725	580
Stornoway	"	780	720	665	650	570	520	455	455	540	610	665	710	615
Calgary Canada (West)	"	1085	1025	925	735	595	435	400	430	560	685	875	1015	745
FORT CHURCHILL	"	1820	1790	1595	1270	985	750	575	625	825	1090	1450	1695	1200
Keg River	"	1245	1230	1020	785	610	475	415	455	570	735	1000	1170	815
Prince George	"	885	885	785	640	520	420	365	370	480	630	790	935	655
The Pas	"	1430	1275	1115	825	620	455	355	410	585	785	1025	1235	845
Vancouver	"	665	640	600	540	460	380	325	330	400	480	565	640	510
Charlottetown (East)	"	1125	1145	1005	850	645	485	360	380	490	660	850	1035	745
Gander	"	1225	1255	1150	970	765	635	460	475	600	780	955	1125	865
Goose Bay	"	1405	1300	1145	950	760	585	440	480	615	815	1025	1270	890
Moosonee	"	1395	1370	1200	975	765	545	435	460	590	745	1005	1230	885
Mitchequon	"	1495	1390	1215	995	790	580	510	515	695	870	1085	1370	960
Port Harrison	"	1715	1720	1585	1320	1040	835	720	715	825	1000	1270	1515	1185
Quebec	"	1345	1335	1135	885	655	465	370	410	545	750	995	1225	845
Sioux Lookout	"	1360	1300	1135	870	645	475	370	420	585	805	1065	1310	865
Aklavik (Territories)	"	1450	1470	1435	1160	855	600	480	570	725	930	1165	1285	1025
Alert	"	1140	1240	1290	1100	1075	755	770	795	1060	1325	1255	1420	1175
Arctic Bay	"	1330	1335	1290	1135	970	795	705	710	895	1045	1285	1270	1100
Baker Lake	"	2030	1835	1585	1480	1070	835	675	670	845	1165	1490	1780	1295
Coppermine	"	1600	1625	1465	1250	970	730	605	655	830	1100	1445	1545	1150
Dawson	"	1345	1105	1045	720	545	405	350	415	565	790	1140	1250	810
Fort Simpson	"	1460	1440	1325	900	515	480	405	495	615	870	1210	1435	930
Mould Bay	"	1675	1890	1735	---	---	945	820	885	1150	1340	1595	1520	-----
Resolution Island	"	1580	1595	1430	1295	1055	915	865	850	925	1065	1225	1435	1180
Jakobshavn Greenland	"	1320	1300	1205	1040	820	705	470	620	775	970	1110	1220	970
Nanortalik	"	1070	1065	1005	910	750	750	670	660	760	825	950	1010	870
Scoresbysund	"	1110	1145	1085	940	745	615	555	575	665	865	940	1010	850
Thule	"	1515	1630	1505	1320	1000	810	715	785	960	1195	1315	1485	1185
Reykjavik Iceland	"	1000	1000	965	860	735	645	575	605	685	815	895	975	815
Devils Lake U. S. A.	"	1340	1200	1065	810	600	435	335	365	520	730	1005	1220	805
Helena	"	1030	950	855	600	570	450	325	355	495	640	815	930	670
Sault Ste. Marie	"	1125	1150	1030	795	620	450	375	390	500	680	890	1050	745

*Values for coldest month are underlined.
**Data from Tables II and VII were combined without regard to period of record.

TABLE IX MEAN CLOUDINESS (tenths of sky cover)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	5-14	4.2	5.2	5.0	5.9	8.5	7.9	8.1	9.0	9.2	8.8	4.7	4.8	6.8
Bethel	12	6.5	6.1	6.5	6.9	7.9	8.0	8.5	9.0	8 4	7.8	7.2	7.1	7.5
Dutch Harbor	10	7.6	7.6	7.4	7.9	8.0	8.0	7.7	7.5	8.0	7.9	7.5	7.2	7.7
FORT GREELY	9	5.5	5.0	6.2	5.5	6.3	5 7	6.4	7.2	6.6	6.7	5.7	5.5	6.0
Juneau	12	7.6	8.1	7.9	8.2	7.8	7.8	8.3	7.9	8.4	8.7	8.3	8.4	8.1
Kodiak	10	6.4	6.4	6.4	6.7	7.7	7.1	7.1	6.5	6.3	6.9	6.7	7.0	6.8
Nome	25	5.9	5.8	5.9	6.5	5.7	6.6	7.9	8.1	7.5	7.1	6.5	6.6	6.8
London British Isles	30	7.5	7.2	6.8	6.5	6.1	6.4	6.6	6.6	5.8	6 5	7.0	7.3	6.7
Stornoway	17	7.7	7.9	7.5	7.4	7.5	7.8	8.3	8.1	8.0	8.0	7.6	7.6	7.8
Calgary Canada (West)	10	6.4	6.4	6.5	6.8	6.9	6.9	4.2	5.3	5.3	5.6	6 3	6.2	5.9
FORT CHURCHILL	8-10	4.7	4.5	4.8	5.9	7.7	7.2	6.4	6.8	8.0	8.3	7.5	5.4	6.4
Embarras	9	5.8	6.1	5.8	6.2	6.3	6.6	6.5	5.7	6.5	6.8	7.0	6.4	6.3
Prince George	10	7.3	6.9	6.3	7.1	6.2	7.1	6.8	6.1	5.7	6.9	7.5	7 5	6.8
The Pas	10	5.3	5.6	5.3	5.4	5.9	6.0	5.4	5.7	5.9	6.2	7.3	5.6	5.8
Vancouver	17	7.6	6.9	6.3	6.0	6.1	5.6	4.1	4.3	5.2	6.8	7.7	7.7	6.2
Charlottetown (East)	10	7.1	6.1	6.2	6.8	6.5	6.3	5.9	5.4	5.4	6.1	7.7	7.5	6.4
Gander	10	7 5	7.6	7.2	7.8	7.8	7.8	7.0	7.0	6.8	7.0	8.2	7.7	7.4
Goose Bay	10	6.1	6.3	6.2	7.2	7.6	7.9	7.7	7.2	7.2	7.5	7.5	6.5	7.1
Moose Factory	18	5.2	5.0	4.9	5.6	6.3	5.8	5.8	5.9	6.6	7.0	7.5	6.3	6.0
Nitchequon	10	5.9	5.8	6.1	6.6	7.4	7.4	7.5	7.4	7.8	8.4	8.0	7.3	7.1
Port Harrison	10	4.9	4.4	5.2	6.6	8.1	7.5	7.2	7.2	8.0	8.3	8.0	7.2	6.9
Quebec	51	6.5	6.1	6.0	5.8	6 2	6.0	5.9	5.6	5.7	6.4	7.4	6.8	6.2
Sioux Lookout	10	6.5	5.9	5.8	6.3	6 6	6.9	6.1	6.1	6.6	6.5	8 3	6.9	6.5
Aklavik (Territories)	8-11	4.9	4.7	4.0	5.0	5.7	5.0	6.0	7.2	7.5	7.2	6.0	5.2	5.7
Alert	2-3	4.8	4.9	3.8	4.2	6.1	6.4	5.8	7.7	6.8	6.8	5.4	4.6	5.6
Arctic Bay	13	3.8	3.2	4.5	4.1	6.1	6.9	6.6	7.5	8.1	7.0	5 0	3.6	5.5
Baker Lake	6-7	3.7	3.7	4.2	4.9	6.9	7.6	6.8	6.3	7.4	7.9	6.1	5.2	5.9
Coppermine	10	5.4	5.0	5.4	4.9	6.9	6.5	6.7	7.7	8.2	8.2	6.7	5.5	6.5
Dawson	15	5.7	4.9	4.4	4.8	4.9	5.3	5.8	5.8	5.9	6.3	6.2	6.3	5.5
Fort Simpson	10	5.4	6.0	5.0	6.0	6.8	6.8	6.6	6.3	6.2	6.9	6 5	6 3	6.2
Mould Bay	3	3.2	4.5	3.8	3.8	5.1	7.8	8.2	8.0	8.6	6.4	4.2	3.2	5.6
Resolution Island	11	7.6	7.3	7.5	7.9	8.2	8.1	7.8	8.0	8.1	8.2	8.6	8 5	8.0
Jakobshavn Greenland	30	5.0	4.4	4.5	4.8	5.1	5.2	4.8	5.0	5.0	5.3	5.3	5.3	5.0
Nanortalik	41	6.7	6.5	6.5	6.4	6.6	6.8	6.5	6.6	6.7	6.3	6.3	6.3	6.5
Scoresbysund	11	5.6	5.6	5.3	5 2	6.2	5.6	5.5	5.8	5.5	5.6	5.9	6.0	5.7
Thule	3	4.7	4.5	4.0	5.6	6.0	6.2	7.3	6.3	6 3	5.7	6.3	4.4	5.6
Reykjavik Iceland	26	7.1	7.2	7.2	7.1	6.9	7 2	7.3	7.3	7.3	6.8	7.0	7.0	7.1
De ils Lake U. S. A.	47	6.0	5.9	6.0	5.7	5.8	5.6	4.5	4.6	5.3	5.7	6 5	6.2	5.7
Helena	64	6.7	6.5	6.5	6.4	6.5	6.0	4.0	4.1	5.1	5.7	6.5	6.8	5.9
Sault Ste. Marie	64	7.9	6.8	6.3	5.9	6.0	5.5	5.2	5.6	6.3	7.2	8 4	8.3	6.6

*Values for coldest and warmest months are underlined.

TABLE X: MEAN SNOW DEPTH (inches)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Barrow Alaska	4-6	12.2	14.5	15.6	15.9	12.6	5.3	T	.0	0.4	3.2	7.4	9.4
Bethel	6-8	10.1	11.6	11.5	7.0	1.3	0.0	0.0	0.0	0.0	0.2	1.2	5.4
Dutch Harbor	8	2.7	8.2	6.2	0.7	0.0	0.0	0.0	0.0	0.0	T	0.1	0.2
FORT GREELY	5	10.7	17.0	14.9	11.6	9.6	2.0	0.0	0.0	T	4.2	7.0	10.5
Juneau	19	4.4	3.8	2.3	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.9	3.3
Kodiak	10	1.6	1 3	0.8	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1.2
Nome	11	8.0	13.0	16.0	11.0	4.0	0.0	0.0	0.0	T	T	2.0	6.0
British Isles				No Data									
Calgary Canada (West)	14-21	6.4	3.4	2.3	0.8	0.0	0.0	0.0	0.0	0.0	0.3	1.3	5.5
FORT CHURCHILL	7-10	16.0	20.9	25.1	20.4	10.6	4.0	T	0.0	0.0	0.7	4.4	10.2
Fort Vermilion	10	17.6	19.3	17.7	8.4	0.0	0.0	0.0	0.0	0.0	1.7	8.1	14.0
Prince George	15-22	9.4	9.9	7.0	2.7	0.0	0.0	0.0	0.0	0.0	0.1	2.9	6.7
The Pas	16-25	12.8	15.6	11.1	3.1	T	0.0	0.0	0.0	0.0	1.0	4.9	9.0
Vancouver	7-13	1.6	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4
Charlottetown (East)	17-33	12.2	13.3	8.1	1.8	0.2	0.0	0.0	0.0	0.0	0.3	1.2	6.6
Gander	5-7	10.8	12.8	12.1	4.9	0.1	0.0	0.0	0.0	0.0	0.0	0.4	5.7
Goose Bay	8-10	28.5	36.5	36.7	25.1	8.8	0.1	0.0	0.0	0.0	1.5	7.8	18.6
Moosonee	8-12	15.0	20.3	20.0	11.1	1.9	0.0	0.0	0.0	0.0	0.1	3.9	9.4
Nitchequon	3-5	24.4	34.6	46.9	43.4	17.7	0.9	0.0	0.0	0.0	4.8	12.8	18.0
Port Harrison	7-11	13.2	15.7	18.1	21.7	13.4	2.7	0.0	0.0	0.0	2.4	7.2	10.3
Quebec	20-34	18.5	28.6	23.7	7.5	0.1	0.0	0.0	0.0	0.0	T	2.0	8.2
Sioux Lookout	13-25	17.5	22.5	18.7	6.7	0.4	0.0	0.0	0.0	0.0	0.5	4.1	10.9
Aklavik (Territories)	5-9	14.6	20.9	21.7	16.7	5.6	0.0	0.0	0.0	0.0	2.5	7.5	9.4
Alert	5	14.3	15.2	14.7	12.8	10.7	4.7	0.4	0.9	5.6	11.2	12.5	13.0
Arctic Bay	4-7	9.1	10.5	11.7	11.0	6.9	1.8	0.0	0.0	1.2	4.5	7.3	8.3
Baker Lake	4-7	11.8	13.0	13.7	16.1	14.4	6.7	1.2	0.0	0.0	2.3	6.4	9.5
Coppermine	4-6	21.9	29.7	30.3	30.1	29.5	1.7	0.0	0.0	0.0	5.3	11.1	16.1
Dawson	17-33	20.6	24.2	23.2	12.1	1.4	0.0	0.0	0.0	0.0	2.4	7.8	9.3
Fort Simpson	4-10	18.9	21.5	18.6	8.1	1.3	0.0	0.0	0.0	0.0	0.8	6.6	14.9
Mould Bay	7	6.1	6.7	7.6	8.7	8.9	4.8	0.4	0.2	1.6	3.5	4.6	5.4
Resolution Island	4-7	26.1	26.9	35.2	27.1	6.5	0.0	0.0	0.0	0.0	1.3	6.2	18.7
Jakobshavn Greenland	5	17.2	20.8	22.3	21.8	11.6	0.4	0.0	0.0	0.0	0.3	4.4	12.3
Narsarssuak	7	4.2	7.3	3.9	2.2	0.6	0.0	0.0	0.0	T	0.6	1.6	2.9
Scoresbysund	5	24.0	25.0	28.0	40.0	39.0	8.0	T	0.0	T	5.0	11.0	22.0
Thule	4-5	2.5	2.0	2.0	2.3	1.1	0.0	0.0	0.0	0.0	0.3	1.1	2.0
Reykjavik Iceland	15	3.0	3.4	1.7	0.8	0.2	0.0	0.0	0.0	T	0.5	1.4	2.1
Devils Lake U. S. A.	20	5.7	6.1	3.5	0.7	0.0	0.0	0.0	0.0	0.0	0.1	1.1	3.5
Helena	40	2.5	2.3	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.7	1.5
Sault Ste. Marie	20-40	12.1	15.0	8.5	1.2	0.0	0.0	0.0	0.0	0.0	0.2	1.9	6.2

*Values for month of greatest depth are underlined.

TABLE XI: MEAN SNOWFALL (inches)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	21-33	2.6	2.7	2.0	2.7	1.8	0.4	1.0	0.7	3.0	7.9	4.3	3.9	33.0
Bethel	16-18	7.2	4.9	8.0	3.3	0.5	0.0	0.0	0.0	0.2	3.3	5.2	9.3	41.9
Dutch Harbor	9-23	15.6	19.7	10.5	6.7	0.1	T	0.0	0.0	T	0.5	5.8	10.8	69.7
FORT GREELY	9	7.0	2.9	5.6	1.3	0.3	T	0.0	T	0.4	6.4	5.3	4.6	33.8
Juneau	33-44	28.1	23.8	14.9	4.6	0.1	0.0	0.0	0.0	0.1	1.5	9.1	25.0	107.2
Kodiak	33-38	9.5	10.6	8.2	5.4	0.3	T	0.0	0.0	T	1.1	3.4	8.4	46.9
Nome	29-34	10.8	8.9	10.2	5.1	1.3	0.2	0.0	T	0.4	3.6	8.5	10.8	59.8
Londor British Isles	60	0.1	0.1	0.3	T	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.7
Calgary Canada (West)	67	5.0	5.8	8.1	6.4	4.2	0.3	T	0.1	2.6	4.2	7.1	5.4	49.2
FORT CHURCHILL	30	4.8	6.1	8.5	7.7	1.8	1.4	0.0	T	1.7	8.0	10.3	6.6	56.9
Fort Vermilion	30	7.0	6.6	7.3	3.2	0.7	T	0.0	0.0	0.4	2.8	6.7	8.6	43.3
Prince George	27	16.2	10.1	8.1	0.6	T	T	0.0	0.0	0.2	1.7	10.0	15.8	62.7
The Pas	30	7.5	7.8	7.9	5.3	0.8	T	0.0	0.0	0.3	3.6	10.4	9.6	53.2
Vancouver	41	11.5	6.4	2.7	0.3	0.0	0.0	0.0	0.0	0.0	0.1	2.1	5.7	28.8
Charlottetown (East)	65	27.1	25.4	20.3	7.3	0.8	0.0	0.0	0.0	0.0	0.3	7.0	24.8	113.0
Gander	14	20.2	24.6	18.0	13.0	4.2	1.3	0.0	0.0	0.2	3.5	9.8	24.4	119.2
Goose Bay	10	22.1	21.8	23.0	15.2	7.7	T	0.0	0.0	0.8	10.5	18.6	24.4	144.1
Moose Factory	40	14.2	10.7	11.3	6.3	3.1	0.4	0.0	0.0	T	2.5	8.2	12.9	69.6
Nitchequon	10	13.2	14.1	15.2	12.2	10.4	0.9	T	0.0	1.0	12.6	20.7	16.0	116.3
Port Harrison	20	6.6	5.1	8.2	7.0	5.3	1.7	T	T	1.8	10.5	19.5	9.6	73.3
Quebec	72	29.3	23.1	20.8	8.7	0.5	0.0	0.0	0.0	T	1.8	14.4	25.1	123.7
Sioux Lookout	23	10.2	8.6	11.6	6.0	2.8	0.0	0.0	0.0	0.8	4.7	10.3	10.5	65.5
Aklavik (Territories)	22	5.5	4.9	3.8	5.0	2.4	1.7	T	1.0	3.1	7.9	7.6	4.2	47.1
Alert	5	1.7	2.5	2.5	2.3	3.1	3.6	3.8	7.8	12.2	7.7	2.1	2.9	52.2
Arctic Bay	13	3.1	2.5	2.9	2.5	2.7	2.3	0.1	0.5	6.2	6.6	3.8	2.7	35.9
Baker Lake	6	2.2	2.0	3.1	2.7	0.8	1.0	T	T	0.4	3.4	3.4	2.9	21.9
Coppermine	30	6.0	4.0	7.1	4.8	4.7	1.4	T	0.1	3.8	10.2	7.8	5.6	55.5
Dawson	41	8.7	7.0	5.1	3.5	0.6	0.1	0.0	T	1.8	7.9	10.4	10.2	55.3
Fort Simpson	42	7.2	7.0	4.8	5.8	4.1	T	0.0	0.1	0.7	8.1	8.5	8.3	54.6
Mould Bay	7	0.8	0.6	1.6	1.4	2.8	1.7	1.1	2.1	4.0	2.8	1.2	1.2	21.3
Resolution Island	19	10.2	10.1	9.6	7.9	8.0	3.2	T	0.2	2.4	8.0	11.8	15.0	86.4
Narsarssuak Greenland	7	17.1	18.0	8.7	7.8	3.2	T	0.0	0.0	1.9	5.9	10.9	11.2	84.7
Søndre Strømfjord	4	3.5	1.1	2.1	2.0	1.2	0.0	0.0	0.0	2.0	7.2	5.8	6.1	31.0
Thule	6	0.6	0.5	1.5	3.3	1.1	0.8	0.0	0.0	2.2	1.5	2.5	1.9	14.9
**Reykjavik Iceland	M	20.8	14.9	8.4	8.6	0.4	T	0.0	0.0	T	1.2	3.3	10.2	67.9
Devils Lake U. S. A.	45	5.3	5.2	5.4	3.0	0.7	T	0.0	0.0	T	1.7	5.5	6.5	33.3
Helena	73	9.9	8.1	9.2	5.1	1.9	0.1	T	T	1.0	3.7	6.8	8.8	54.6
Sault Ste. Marie	50	18.6	13.4	10.2	3.5	0.6	0.0	0.0	0.0	T	2.3	12.6	18.1	79.3

* Values for month of greatest snowfall are underlined.
** NW of Reykjavik, newly uncovered data, not shown on map (Fig 9) (period of record missing - M)

TABLE XII: MEAN PRECIPITATION (inches)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	25-27	0.15	0.20	0.13	0.12	0.14	0.26	0.89	0.73	0.49	0.56	0.30	0.26	4.23
Betsel	18-19	0.96	0.61	0.77	0.53	0.74	1.13	2.37	3.89	3.31	1.60	0.98	0.79	17.68
Dutch Harbor	19-23	6.32	6.12	4.92	4.19	4.33	4.82	1.89	2.45	5.45	7.39	5.81	6.92	58.61
FORT GREELY	9	0.40	0.20	0.30	0.30	0.60	2.10	3.20	2.10	1.20	0.40	0.30	0.30	11.40
Juneau	46-51	7.16	5.53	5.51	5.39	5.22	4.04	5.14	7.38	10.17	11.41	9.19	7.58	83.72
Kodiak	46-52	4.82	4.88	3.94	4.20	5.94	4.86	3.56	5.04	5.48	7.45	5.60	6.17	61.94
Nome	35-37	1.09	0.81	0.84	0.67	0.64	1.12	2.50	3.22	2.71	1.58	0.97	1.11	17.26
London British Isles	64	2.00	1.67	1.83	1.64	1.76	2.03	2.24	2.23	1.95	2.61	2.36	2.39	24.71
Stornoway	58	5.62	4.18	3.79	2.96	2.59	2.46	2.97	3.99	4.20	5.43	5.48	5.84	49.51
Calgary Canada (West)	55	0.51	0.55	0.84	0.99	2.34	3.14	2.51	2.29	1.50	0.69	0.72	0.57	16.65
FORT CHURCHILL	20	0.41	0.36	0.63	0.69	0.65	1.51	2.81	2.54	1.97	1.50	0.78	0.56	14.41
Fort Vermilion	30	0.71	0.66	0.74	0.61	1.36	1.67	1.87	1.66	1.27	0.61	0.74	0.86	12.76
Prince George	27	1.81	1.21	1.44	0.84	1.34	2.06	1.63	1.94	2.00	1.99	1.87	1.85	19.98
The Pas	30	0.77	0.78	0.83	0.93	1.38	2.30	2.42	2.30	2.06	1.11	1.13	0.97	16.98
Vancouver	41	8.57	8.79	5.03	3.34	2.84	2.45	1.22	1.69	3.63	5.78	8.28	8.76	57.38
Charlottetown (East)	65	3.76	3.01	3.15	2.78	2.66	2.58	2.98	3.35	3.45	4.07	3.75	3.98	39.47
Gander	14	2.63	3.28	2.79	2.57	2.56	2.79	3.61	3.59	3.66	4.09	4.21	3.72	39.50
Goose Bay	10	2.27	2.29	2.36	1.91	2.12	2.39	3.24	2.79	2.25	2.44	2.50	2.49	29.05
Moose Factory	40	1.42	1.07	1.30	1.15	1.59	1.97	2.29	3.03	2.44	1.78	1.05	1.38	20.47
Nitchequon	10	1.34	1.44	1.65	1.55	2.65	3.75	4.07	4.12	3.12	3.11	2.44	1.67	30.88
Port Harrison	20	0.66	0.31	0.82	0.74	0.80	0.88	1.54	1.61	2.21	2.05	2.06	0.96	14.64
Quebec	72	3.45	2.74	3.02	2.35	3.15	3.68	4.02	3.98	3.60	3.41	3.23	3.22	39.85
Sioux Lookout	23	1.03	0.88	1.30	1.74	1.86	3.46	3.47	2.76	3.46	1.78	1.72	1.06	24.52
Aklavik (Territories)	22	0.55	0.49	0.78	0.50	0.49	0.80	1.39	1.42	0.91	0.86	0.76	0.42	8.97
Alert	5	0.17	0.25	.25	0.23	0.31	0.47	0.65	1.28	1.23	0.77	0.21	0.29	6.11
Arctic Bay	13	0.31	0.25	0.29	0.25	0.29	0.44	0.68	1.37	0.81	0.66	0.38	0.27	5.80
Baker Lake	6	0.22	0.20	0.31	0.27	0.21	0.70	0.86	1.09	0.83	0.50	0.34	0.29	5.82
Coppermine	30	0.60	0.40	0.71	0.67	0.55	0.91	1.52	1.69	1.25	1.23	0.78	0.56	10.87
Dawson	41	0.87	0.70	0.52	0.51	1.01	1.18	1.53	1.55	1.41	1.17	1.13	1.03	12.61
Fort Simpson	42	0.72	0.70	0.48	0.70	1.37	1.46	1.99	1.47	1.31	1.07	0.85	0.84	12.96
Mould Bay	7	0.08	0.06	0.16	0.14	0.28	0.27	0.63	0.63	0.48	0.28	0.12	0.12	3.25
Resolution Island	19	1.02	1.02	0.97	0.83	1.14	1.30	1.83	1.59	2.02	1.27	1.22	1.50	15.71
Jakobshavn Greenland	30	0.33	0.30	0.50	0.69	0.76	0.76	1.26	1.50	1.29	1.31	0.74	0.63	10.07
Nanortalik	4	2.78	4.11	1.49	2.45	1.54	4.56	1.20	3.46	2.04	4.73	3.76	1.92	34.04
Scoresbysund	10	1.80	1.70	1.61	1.49	0.30	1.00	0.60	0.40	1.15	1.05	1.06	1.44	12.50
Thule	6	0.11	0.08	0.10	0.13	0.10	0.15	0.41	0.60	0.37	0.13	0.19	0.18	2.55
Reykjavik Iceland	50	3.86	3.31	2.72	2.44	1.89	1.93	1.89	2.01	3.54	3.43	3.74	3.50	34.26
Devils Lake U. S. A.	45	0.42	0.43	0.67	1.34	2.09	3.22	2.68	2.26	1.90	1.11	0.69	0.50	17.31
Helena	73	0.76	0.57	0.76	0.99	1.93	2.26	1.10	0.80	1.20	0.82	0.67	0.72	12.58
Sault Ste. Marie	64	2.00	1.44	1.78	2.09	2.68	2.91	2.61	2.84	3.49	3.00	3.05	2.23	30.12

*Values for month of greatest precipitation are underlined.

TABLE XIII: MEAN RELATIVE HUMIDITY (%)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	11	64	62	65	74	87	93	92	93	93	92	86	76	80
Bethel	7	80	79	81	82	79	77	83	89	88	88	86	80	83
Fairbanks (for FORT GREELY)	15	69	68	66	61	58	62	70	76	76	79	73	71	69
Juneau	12	80	79	78	75	76	74	78	81	85	85	84	81	80
Nome	15	78	79	79	80	80	81	86	86	83	81	81	81	81
London British Isles	30	84	82	79	75	73	73	73	76	79	85	86	86	79
Stornoway	18	87	86	84	82	80	80	84	85	85	86	86	87	84
Calgary Canada (West)	7	72	76	71	64	63	70	66	65	69	70	73	72	69
FORT CHURCHILL	10	91	90	90	89	85	76	72	72	85	86	93	94	85
Embarras	4-5	83	81	78	68	62	62	66	70	75	79	87	89	75
Prince George	6	88	80	72	67	62	72	73	73	77	81	89	92	78
The Pas	10	93	90	81	63	53	60	61	64	65	71	86	94	73
Vancouver	7	89	85	80	78	76	76	76	77	83	86	88	90	82
Charlottetown (East)	5	77	77	71	70	71	73	73	74	75	75	77	75	74
Gander	7	88	88	84	80	79	79	76	80	83	84	86	87	83
Goose Bay	5	84	83	74	71	68	67	63	69	70	73	80	87	74
Kapuskasing	7	91	90	84	72	70	71	73	78	83	86	90	90	82
Lake Dore	5-6	89	88	86	79	77	74	77	80	84	85	90	89	83
Port Harrison	6-7	--	--	--	93	93	89	87	90	91	93	94	--	--
Quebec	5	78	78	82	76	74	77	80	81	83	83	84	82	80
Sioux Lookout	6	90	87	75	65	68	73	73	77	81	79	89	91	79
Aklavik (Territories)	10	96	97	92	84	77	68	68	79	88	95	97	94	82
Arctic Bay	5	--	--	--	--	83	77	79	83	83	82	--	--	--
Baker Lake	6	70	78	83	87	87	84	82	75	84	87	92	82	83
Coppermine	9	--	--	--	--	--	73	81	82	87	93	--	--	--
Dawson	9	--	--	--	--	52	57	60	66	71	--	--	--	--
Fort Simpson	8	82	89	69	56	46	44	45	54	59	74	89	89	76
Resolution Island	7-9	97	--	--	--	97	94	93	91	94	98	--	98	--
Jakobshavn Greenland	30	76	74	79	83	77	73	71	71	75	78	78	77	76
Myggbukta	6	76	75	76	74	80	79	83	83	75	71	76	78	78
Nanortalik	23	75	76	74	72	72	73	76	78	76	75	74	75	75
Thule	6	76	76	74	75	76	80	82	74	76	79	80	76	77
Reykjavik Iceland	3	81	80	80	74	70	75	75	74	74	78	81	81	77
Devils Lake U. S. A.	12	85	85	82	71	67	71	70	69	69	68	81	82	75
Helena	13-65	67	66	62	56	56	56	48	47	55	61	66	69	59
Sault Ste. Marie	9-61	84	83	78	76	70	74	76	77	81	80	82	84	79

*Values for months of highest known relative humidity are underlined.

TABLE XIV: MEAN NUMBER OF DAYS WITH FOG (visibility one mile or less)*

Station	Yrs Rec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Barrow Alaska	4	5	10	2	4	8	10	15	15	5	3	3	1	82
Bethel	10	5	6	5	6	4	2	5	7	7	4	5	1	63
Dutch Harbor	10	1	1	1	<1	2	5	4	2	2	1	0	<1	19
FORT GREELY	5	1	<1	<1	<1	<1	<1	<1	1	2	2	1	1	8
**Juneau	13	2	2	2	1	1	<1	<1	1	3	3	3	2	21
Kodiak	8	3	5	3	5	6	9	8	6	5	3	4	4	61
Nome	10	5	5	5	4	5	11	8	6	4	4	3	7	67
London British Isles	10	7	7	6	3	1	<1	<1	1	5	8	8	7	54
Stornoway	15	0	0	<1	<1	<1	<1	<1	<1	<1	<1	0	<1	3
Calgary Canada (West)	10	4	2	2	2	1	2	1	1	1	2	4	3	25
Embarras	6	1	<1	1	<1	1	<1	1	1	3	1	1	3	12
FORT CHURCHILL	10	1	1	<1	1	1	4	2	2	1	<1	<1	0	13
Prince George	10	4	3	2	1	1	1	4	5	8	6	4	6	45
The Pas	10	3	1	1	1	1	2	2	3	3	2	2	2	23
Vancouver	27	4	3	1	<1	<1	<1	0	<1	2	6	6	5	28
Charlottetown (East)	20	0	1	1	1	0	0	0	0	0	1	1	0	-
Gander	6	4	6	6	9	11	8	6	5	5	4	6	6	77
Goose Bay	5	<1	1	1	1	1	1	2	<1	2	2	1	1	14
Moose Factory	8	0	1	0	<1	2	2	1	2	1	<1	<1	0	9
Nitchequon	5	1	<1	1	1	2	2	0	2	1	1	2	<1	10
Port Harrison	6	5	2	3	3	4	7	7	8	6	4	1	2	51
Quebec	35	1	<1	1	1	<1	<1	<1	<1	1	2	1	1	9
Sioux Lookout	6	1	1	<1	1	1	2	2	3	3	2	1	1	18
Aklavik (Territories)	10	1	1	0	0	<1	<1	<1	<1	1	2	<1	1	8
Alert	4	<1	<1	2	1	10	8	7	8	4	5	2	1	47
Arctic Bay	4	0	0	1	<1	<1	1	4	9	2	1	1	0	18
Baker Lake	6	<1	<1	<1	0	<1	2	2	1	<1	<1	0	<1	8
Coppermine	10	<1	1	1	2	3	3	2	2	2	1	1	1	20
Dawson	24	3	1	1	<1	<1	<1	<1	1	2	2	1	3	15
Fort Simpson	10	2	<1	1	<1	<1	1	1	1	2	2	1	1	14
Mould Bay	5	1	2	3	1	4	4	4	8	8	2	<1	0	38
Resolution Island	10	1	1	1	1	5	10	13	12	7	2	1	<1	55
Jakobshavn Greenland	30	9	7	9	11	12	12	11	11	9	9	9	9	118
Nanortalik	41	<1	1	1	2	7	10	15	13	7	3	1	<1	60
Scoresbysund	11	4	6	6	8	15	14	11	8	9	5	4	6	96
Thule	6	1	<1	1	1	2	4	4	2	1	<1	<1	<1	17
Reykjavik Iceland	16	1	1	1	1	1	2	2	2	2	2	2	1	18
**Devils Lake U. S. A.	45	1	1	1	1	<1	<1	<1	1	1	1	1	1	10
**Helena	70	1	<1	<1	<1	<1	<1	0	<1	<1	<1	<1	1	6
**Sault Ste. Marie	61	1	2	2	1	1	1	2	2	3	3	1	2	21

*Values for months of greatest fog frequency are underlined.
**Dense fog only

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98. U. S. Navy Department, Hydrographic Office, Ice Atlas of the Northern Hemisphere, H. O. No. 550, 1st ed, Washington, 1946

99. ———, Naval Air Pilot, Greenland - Iceland Weather Summary, Supplement B to H. O. No. 252, G20, prepared by the US Weather Bureau, Washington, 1943

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101. ——, Weather Summary, Alaska Area, H. O. No. 526, prepared by the US Weather Bureau, Washington, 1944

102. U. S. Navy Department, Office of the Technical Assistant to the Chief of Naval Operations for Polar Projects, Canadian North, OPNAV P03-4, Washington, 1956

103. Villeneuve, G.O., Climatic Conditions of the Province of Quebec and their Relationship to the Forests, Bulletin No. 6, Quebec Bureau of Meteorology, Montreal, 1946

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9. Maps

Map Errata

Fig. 1 Bell Island (off Newfoundland) should read: Belle Isle
Skwenta (southern Alaska) should read: Skwentna

Fig. 2 Koskokwim Upland (central Alaska) should read: Kuskokwim Upland

Fig. 3 Tree Point (Alaskan Panhandle) - missing value is: 35J
Barter Island (Alaskan north coast) - value should be: -27F

Fig. 4 Lake Louise (Alberta) - value should be: -8

Fig. 5 In area of Amundsen Gulf (southeast of the Beaufort Sea) coastal area north of the -52° isotherm should be devoid of blue tint.

Fig. 10 In Siberia the blue tint should extend southward to include entire land area south of 64° N. latitude.

Fig. 13 Brønlundsfjord (Greenland north coast) - station missing and value is 2.3

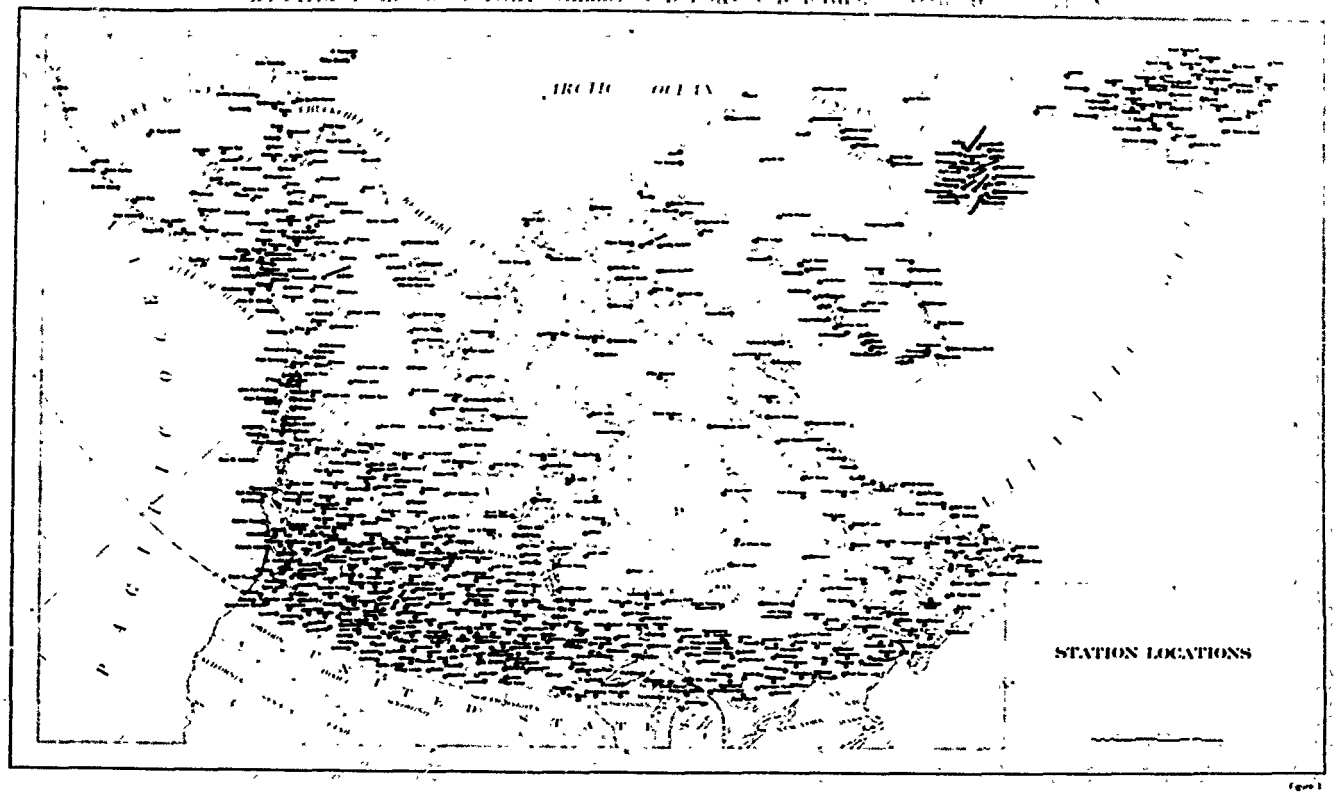
Fig. 13A Quesnel (central British Columbia within island of dark blue tint) should be connected by a line to the following data printed on the map northeast of that station $\frac{5JA}{6J}$ $\frac{89}{15S}$ and the station dot accompanying data should be removed

Jan Mayan (island in Greenland Sea) - station missing and data are $\frac{3MA}{10A}$. $\frac{58}{13J}$

Wiseman (central Alaska) - data should read $\frac{1JA}{1J}$. $\frac{16}{3S}$

Eagle (eastern Alaskan boundary) - mean annual days should be 6
Yakutat (gulf coast of Alaska) - coldest month days should be 1JA
Taku Pass (near Juneau) - coldest month days should be <1JA
Dawson (Yukon) - coldest month days should be 3JA
Teslin (southern Yukon) - warmest month days should be 1J
Fort Norman (Mackenzie District, Canada) - coldest month should be January (JA)
Eureka (Ellesmere Island, Arctic Archipelago) - warmest month days should be <1J
Nord (north coast Greenland) - coldest month should be March (MA)
Prins Christians Sund (south coast Greenland) - coldest month days should be <1F
Godhavn (Disko Island, west Greenland) - warmest month days should be 17J
Tynemouth (east coast, England) - foggiest month should be January (JA)

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL



CLIMATIC ANALOGS OF FORT GREELY AND FORT [illegible]

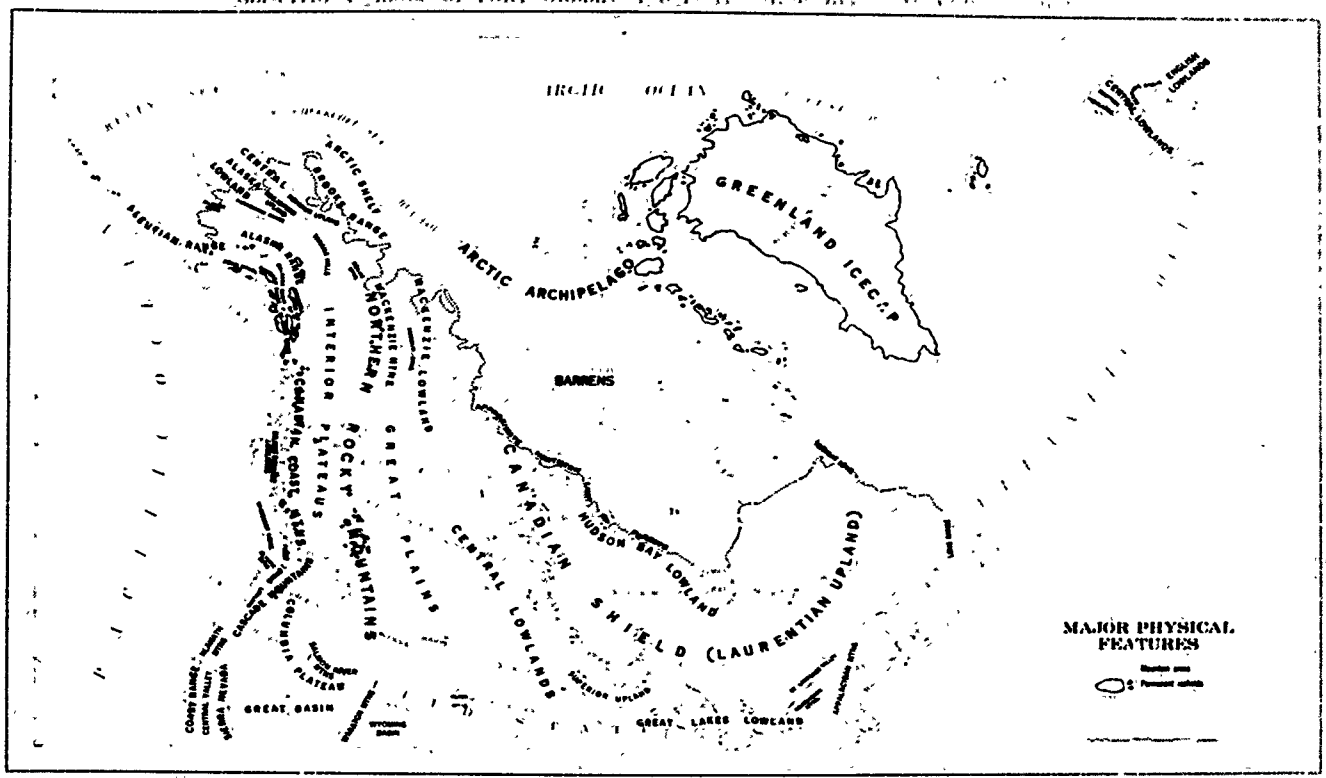
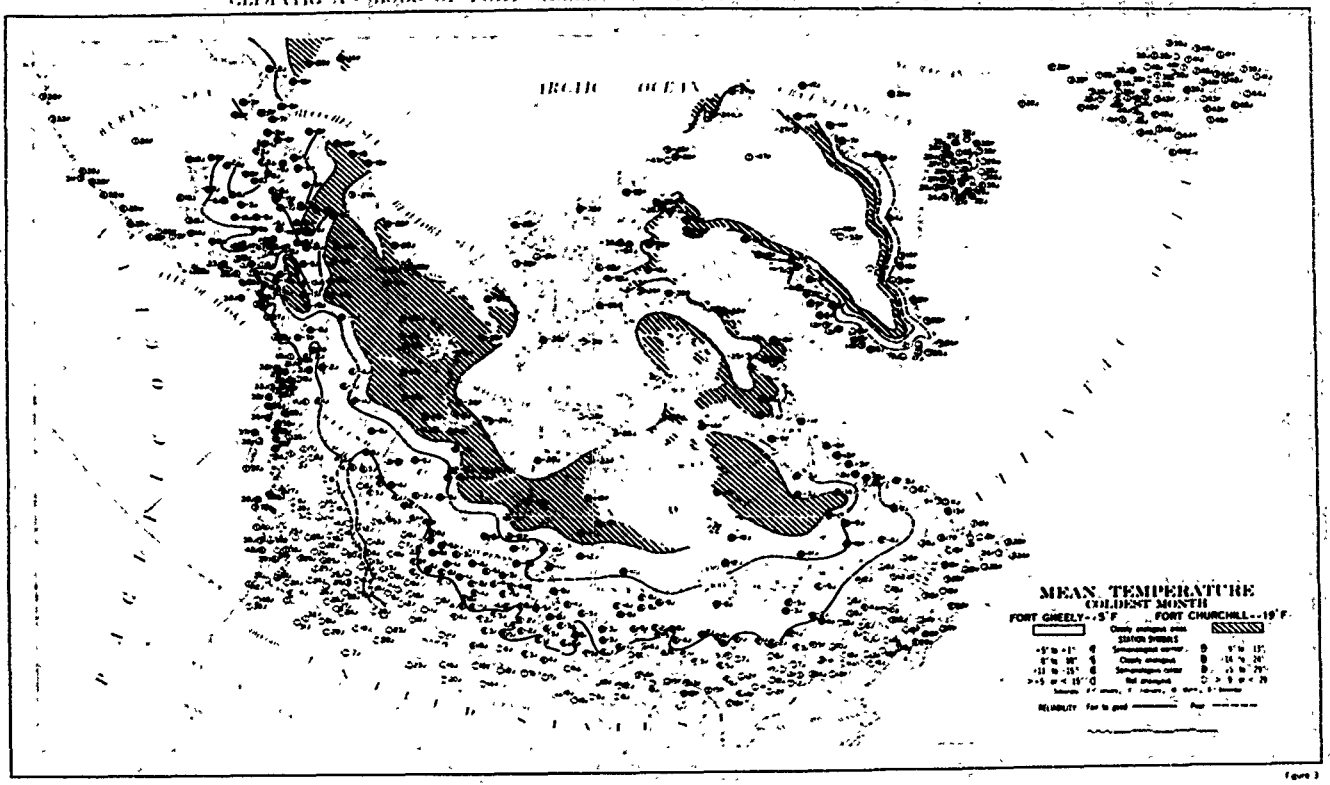
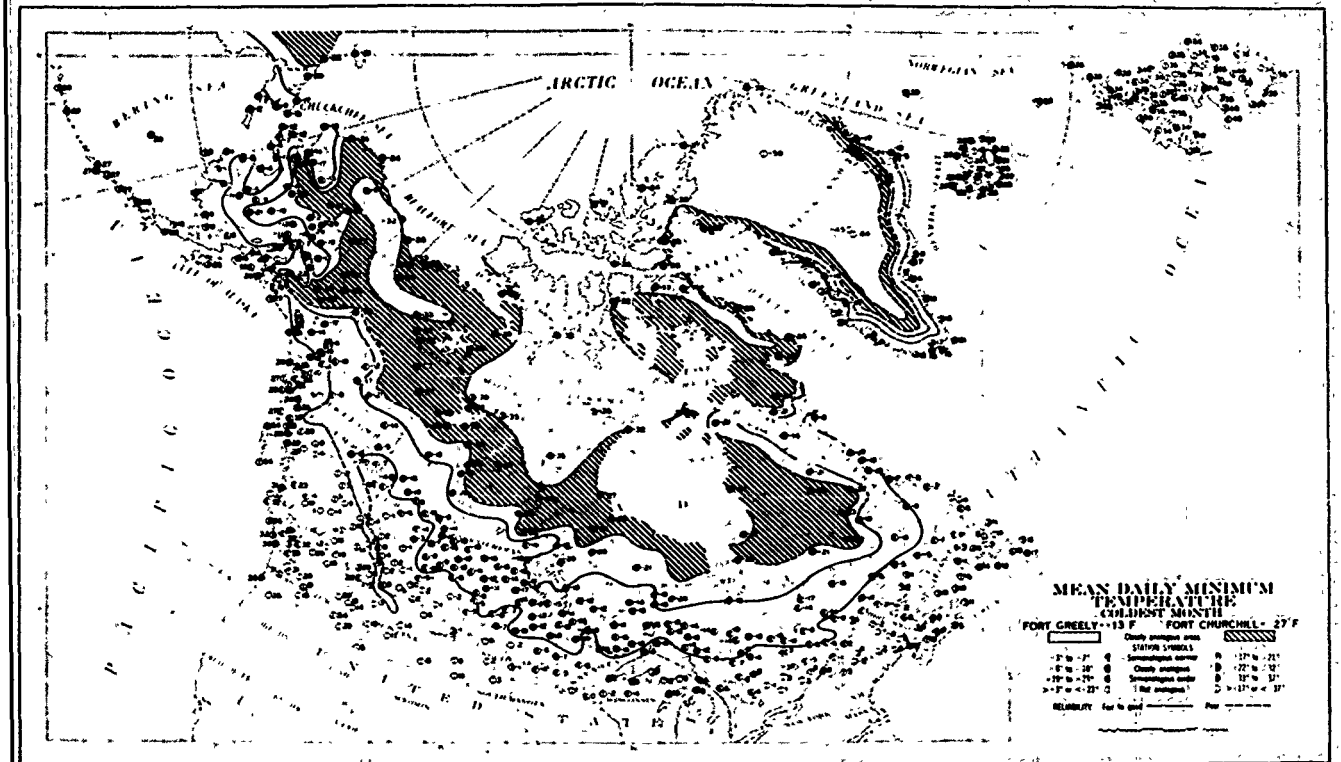


Figure 2

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL – NORTH AMERICA



CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL – NORTH AMERICA



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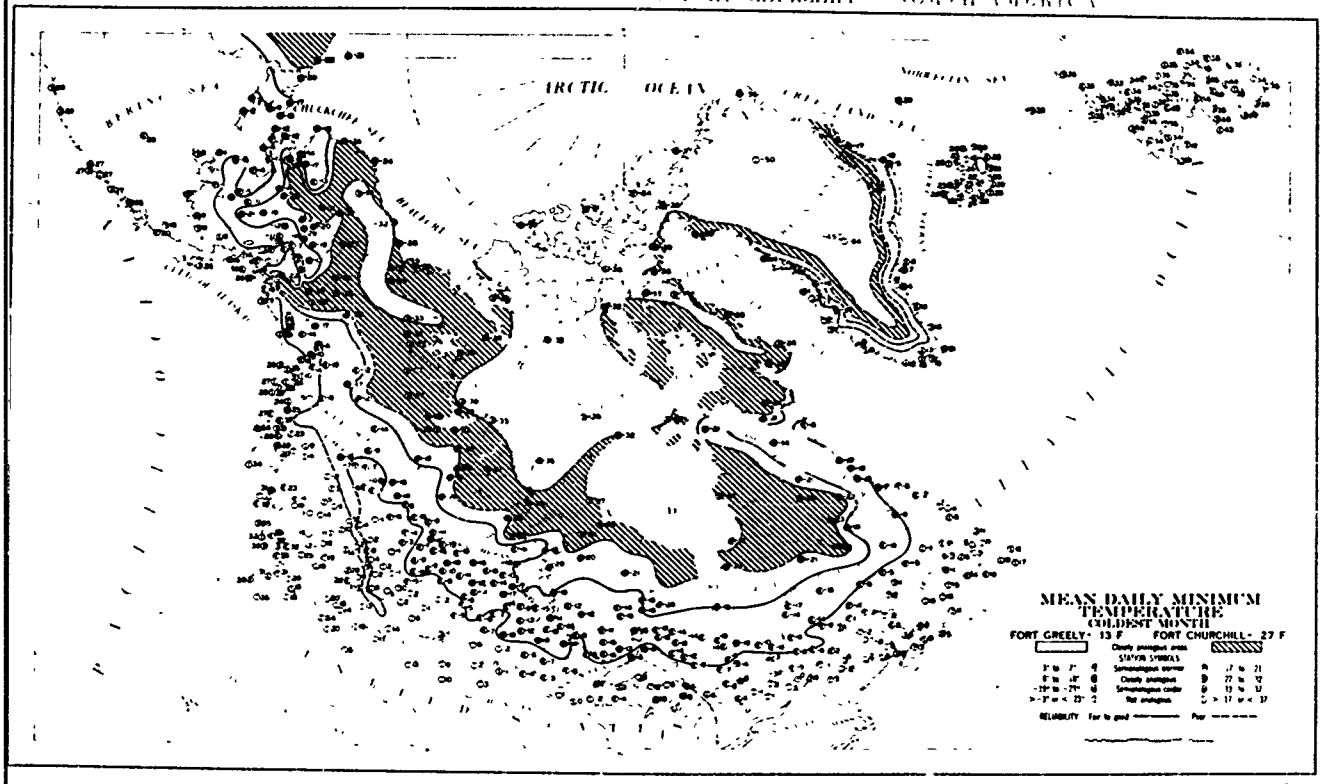
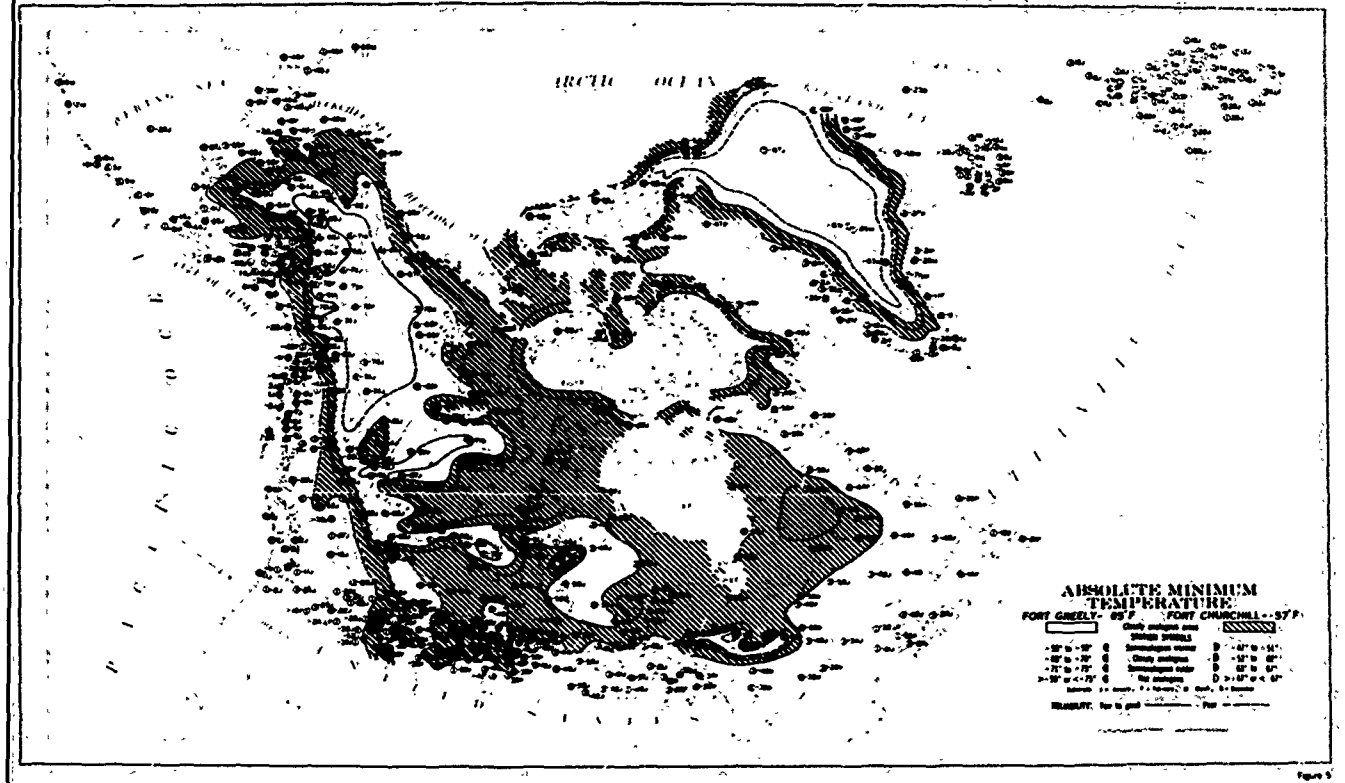


CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL — NORTH AMERICA



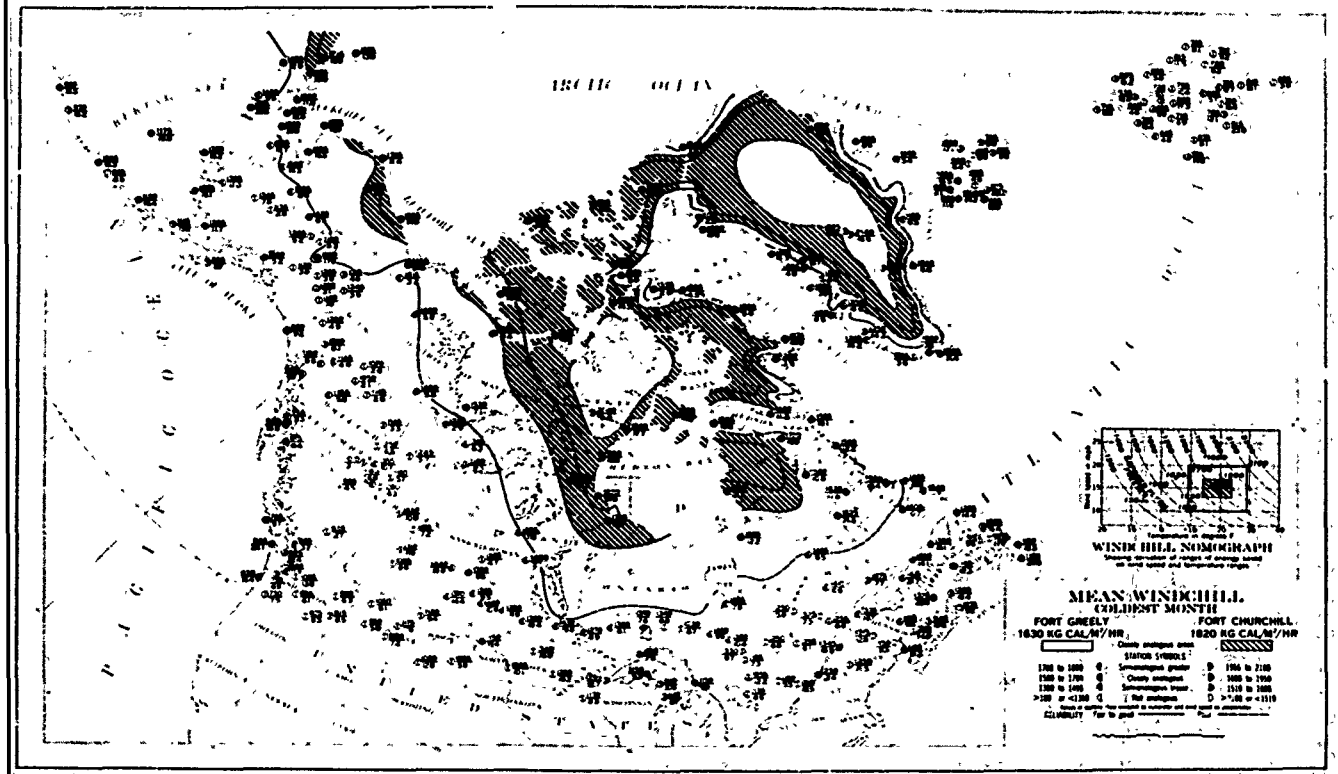
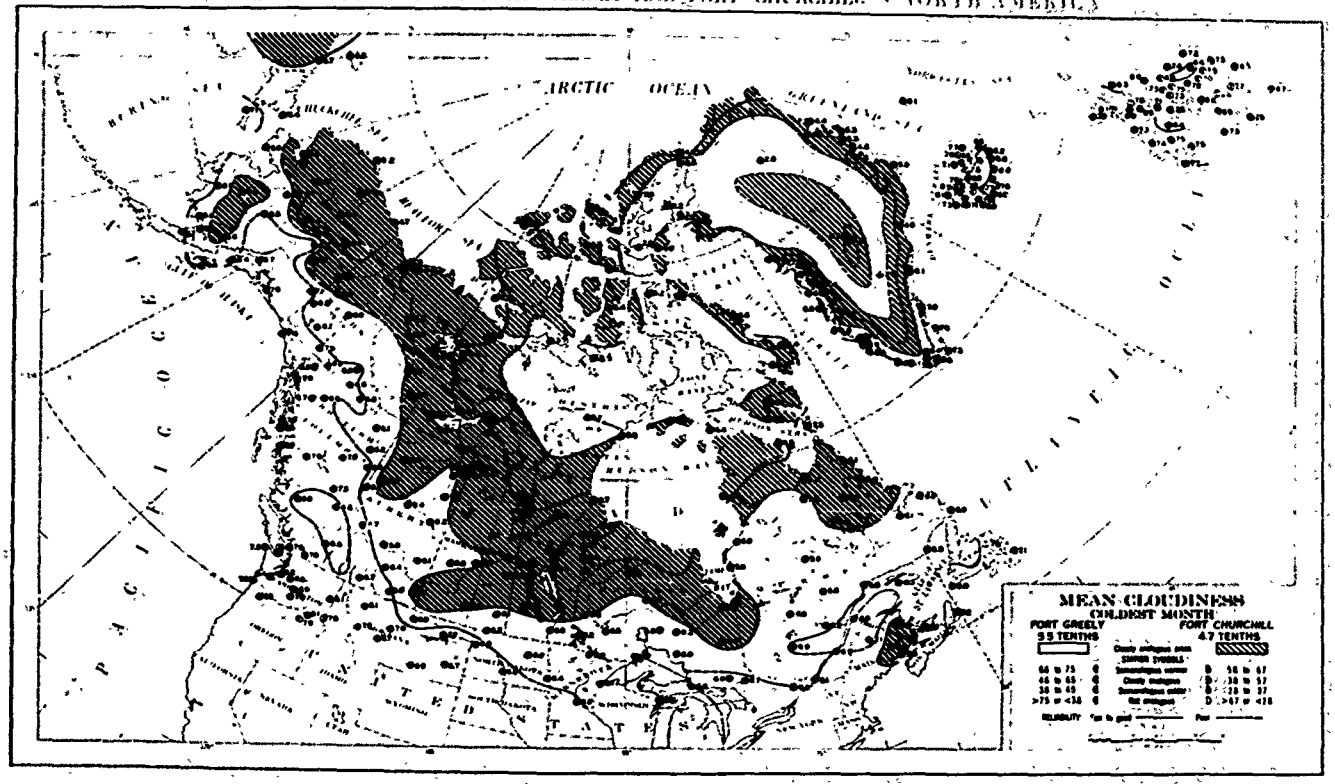

ARCTIC OCEAN
PACIFIC OCEAN
WIND CHILL NOMOGRAPH
MEAN WINDCHILL
COLDEST MONTH
FORT GREELY
1630 KG CAL/M²/HR
FORT CHURCHILL
1820 KG CAL/M²/HR
STATION SYMBOLS

Figure 6

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL — NORTH AMERICA



CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL – NORTH AMERICA

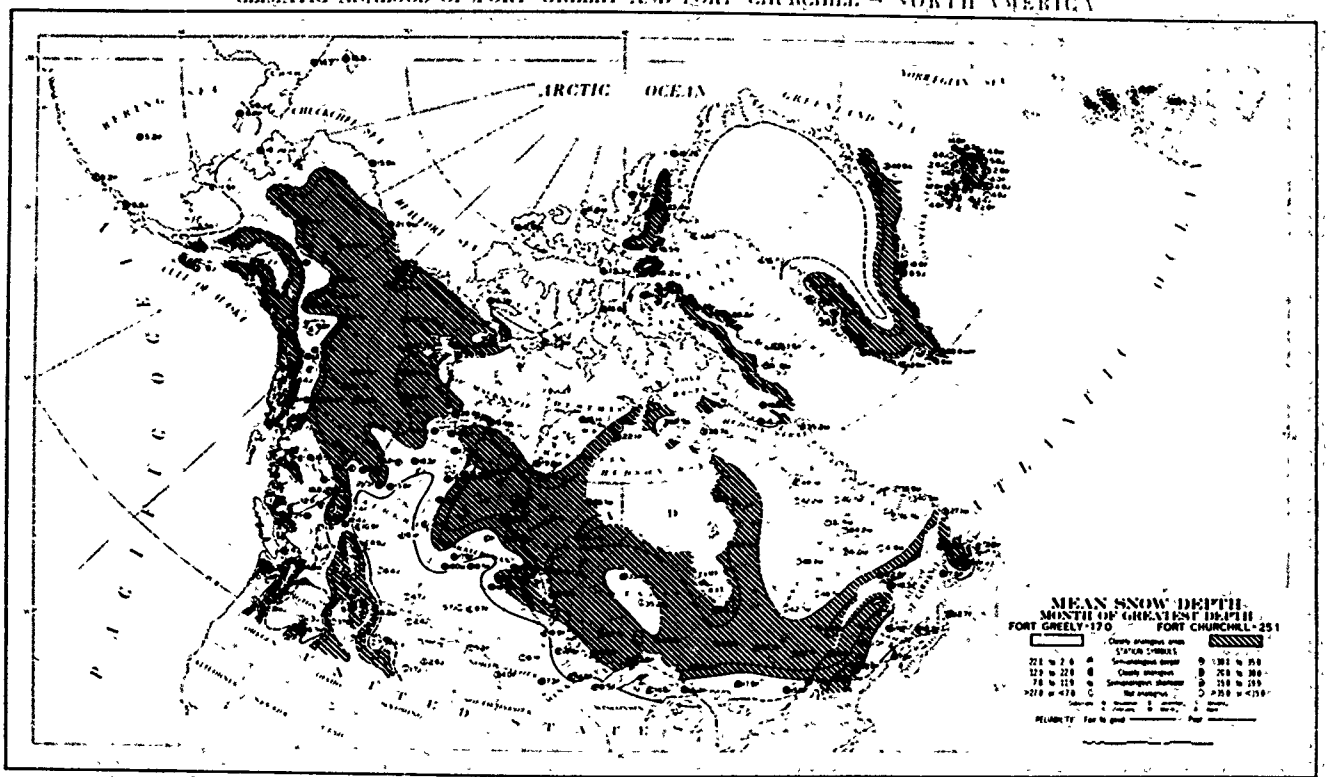


Figure 6

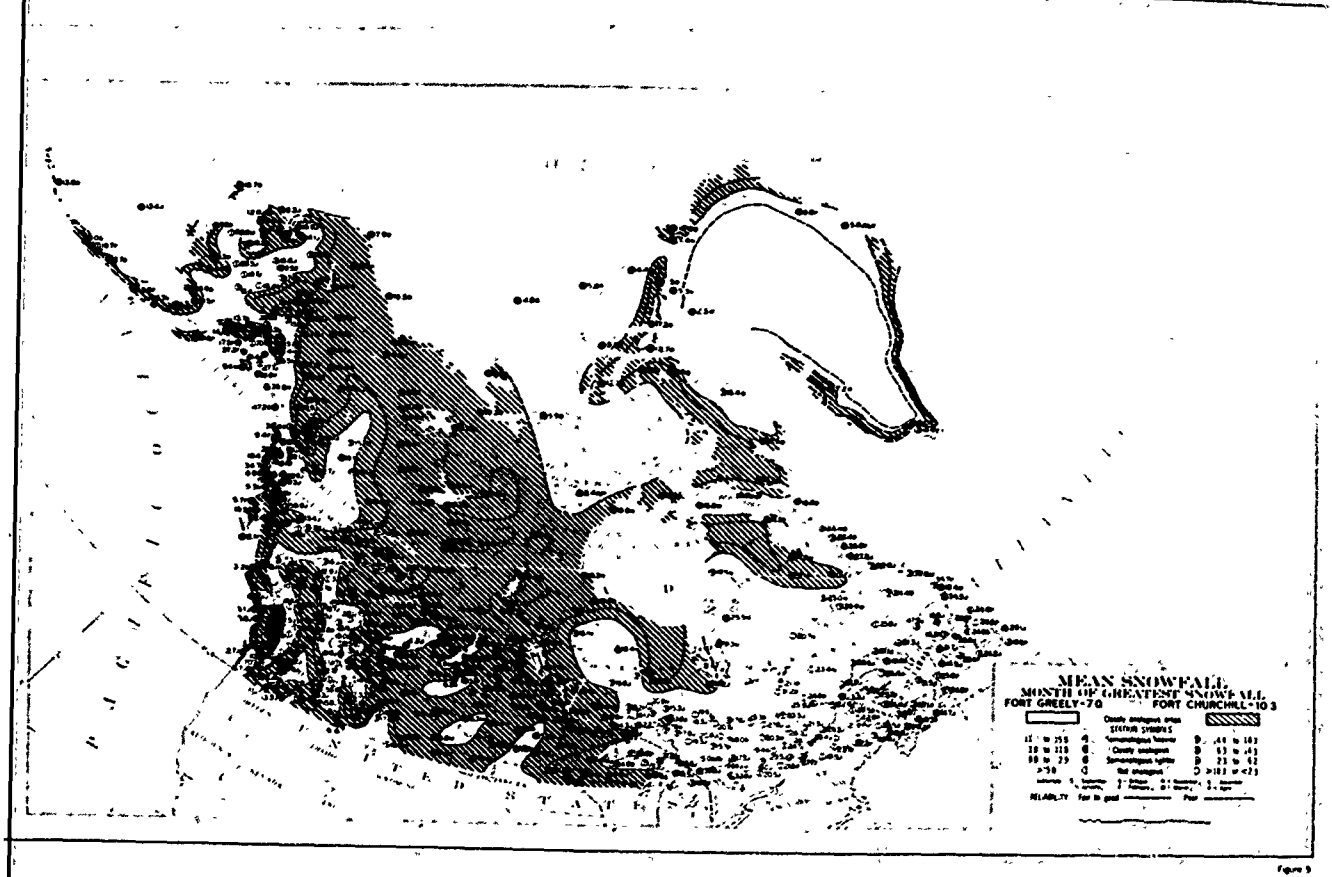

MEAN SNOWFALL
MONTH OF GREATEST SNOWFALL
FORT GREELY-70
FORT CHURCHILL-103

Figure 9

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL – NORTH AMERICA

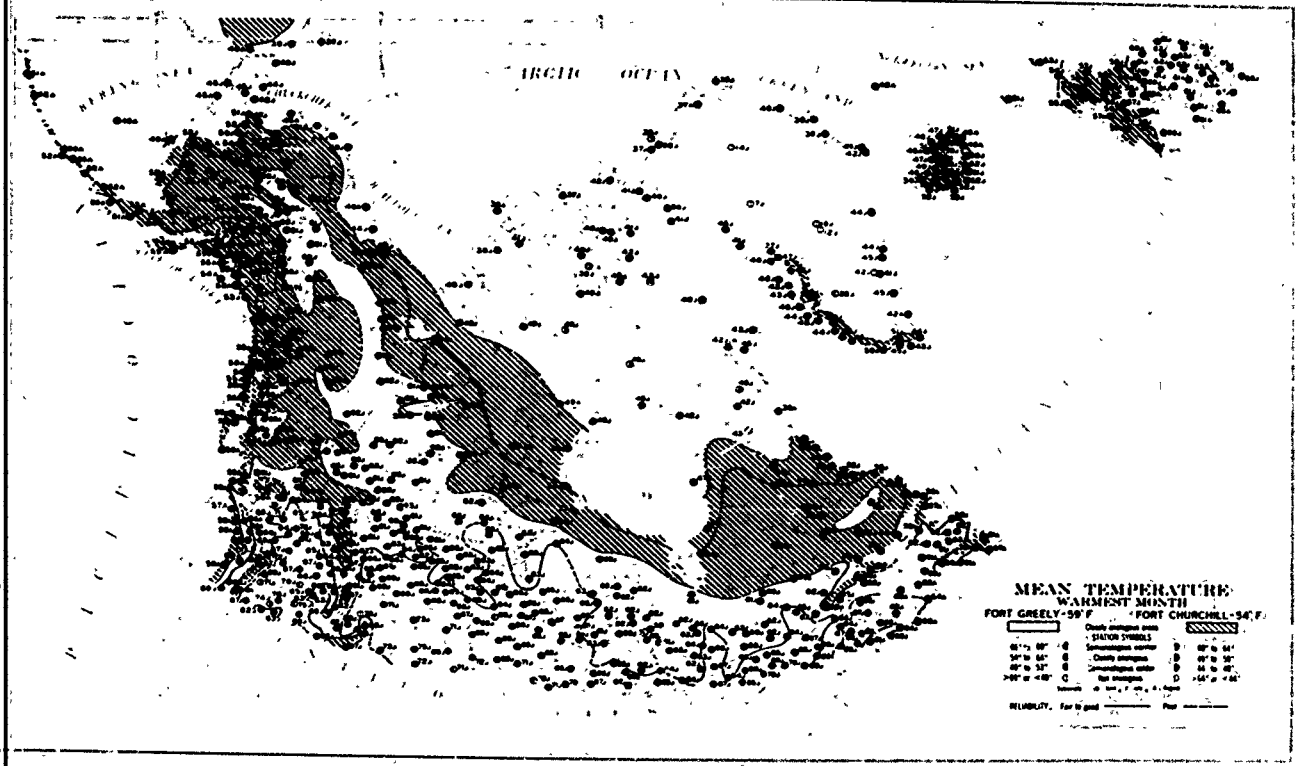


Figure 10

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL - NORTH AMERICA

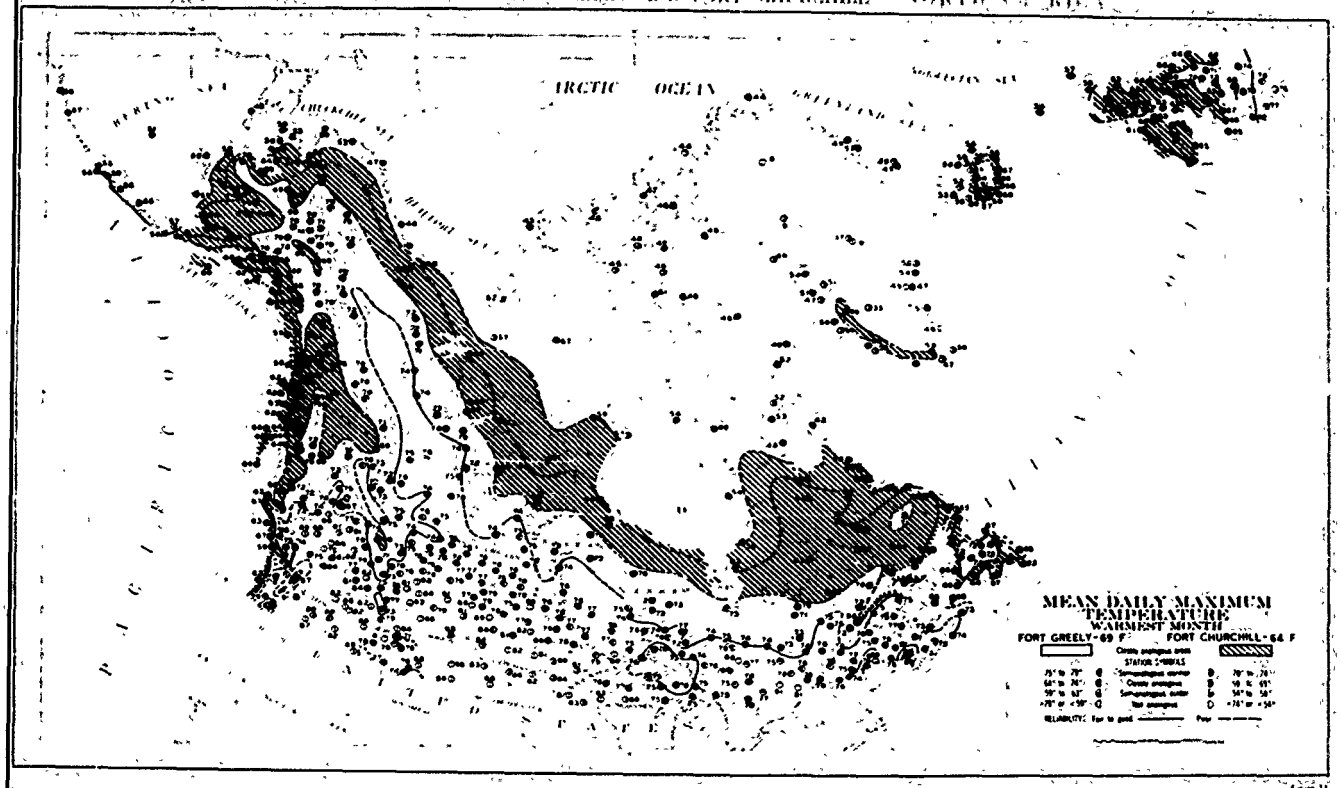


Figure 11

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL – NORTH AMERICA

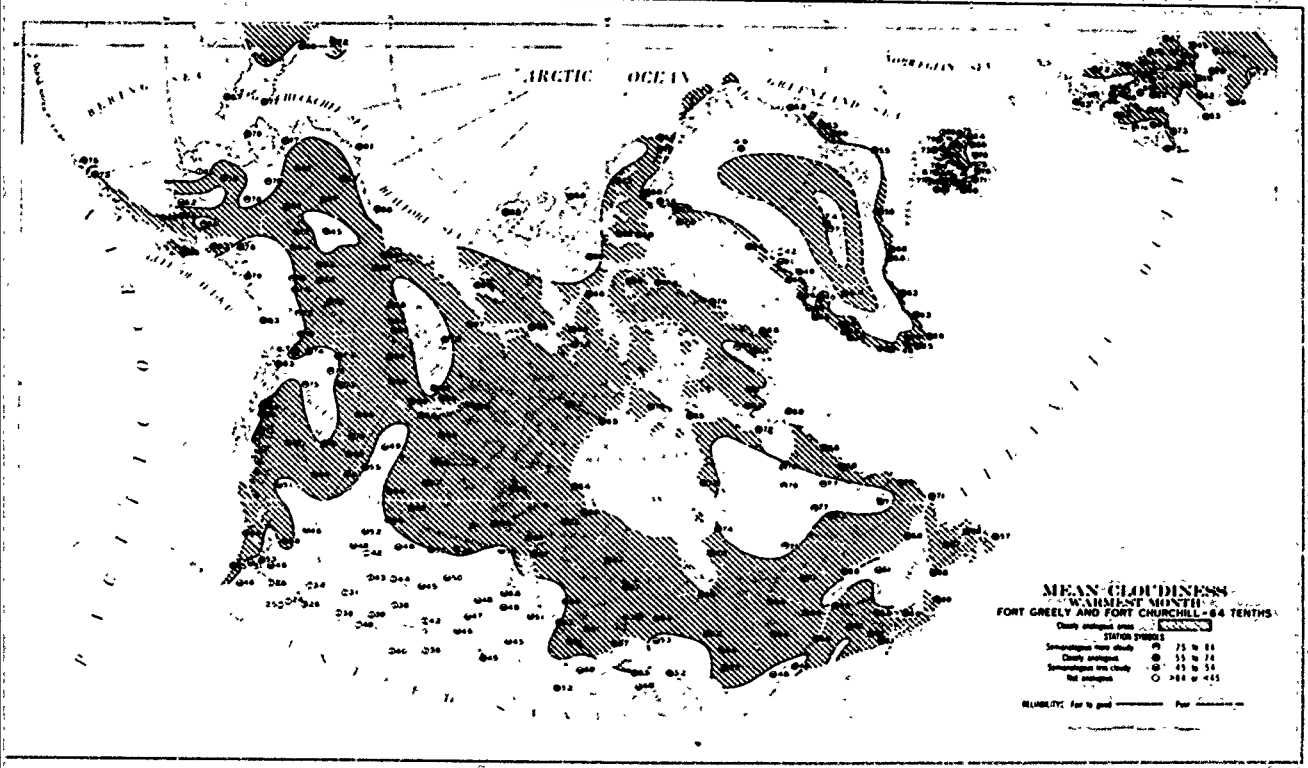


Figure 12

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL

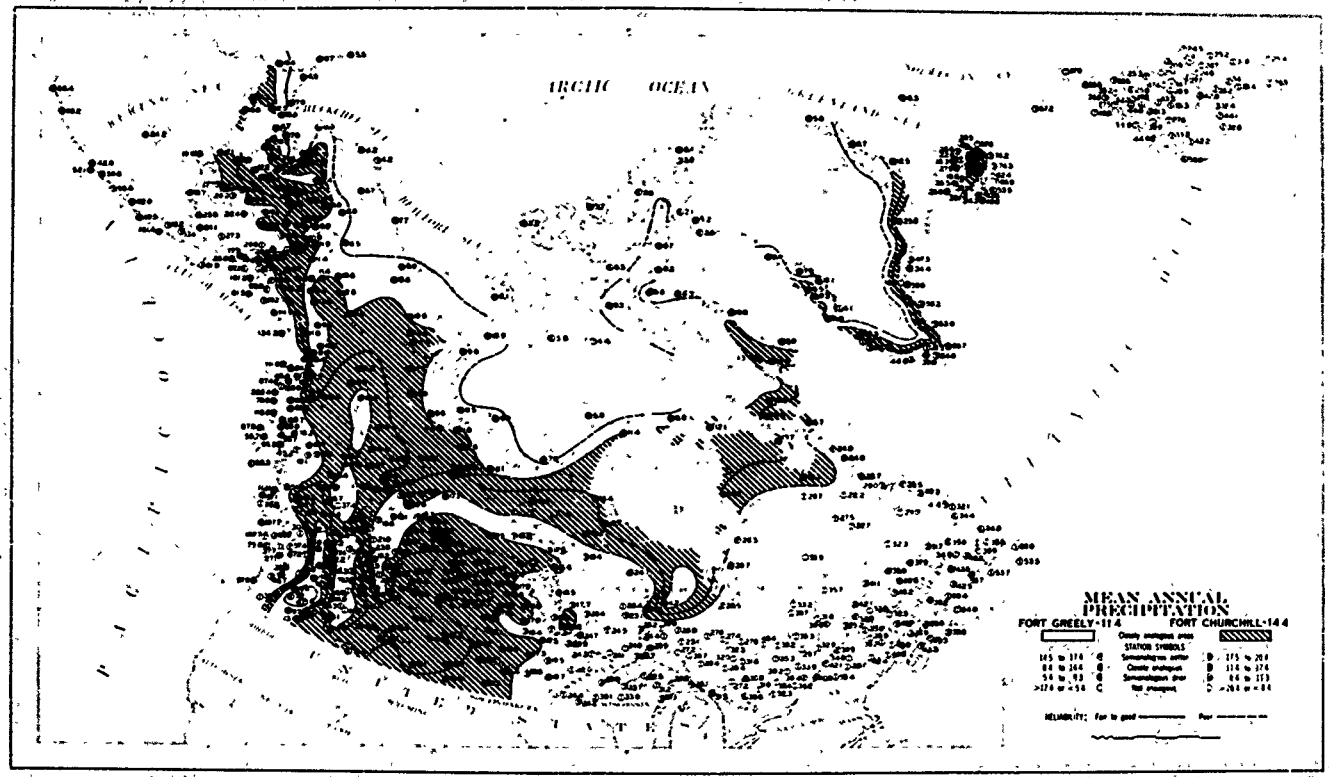
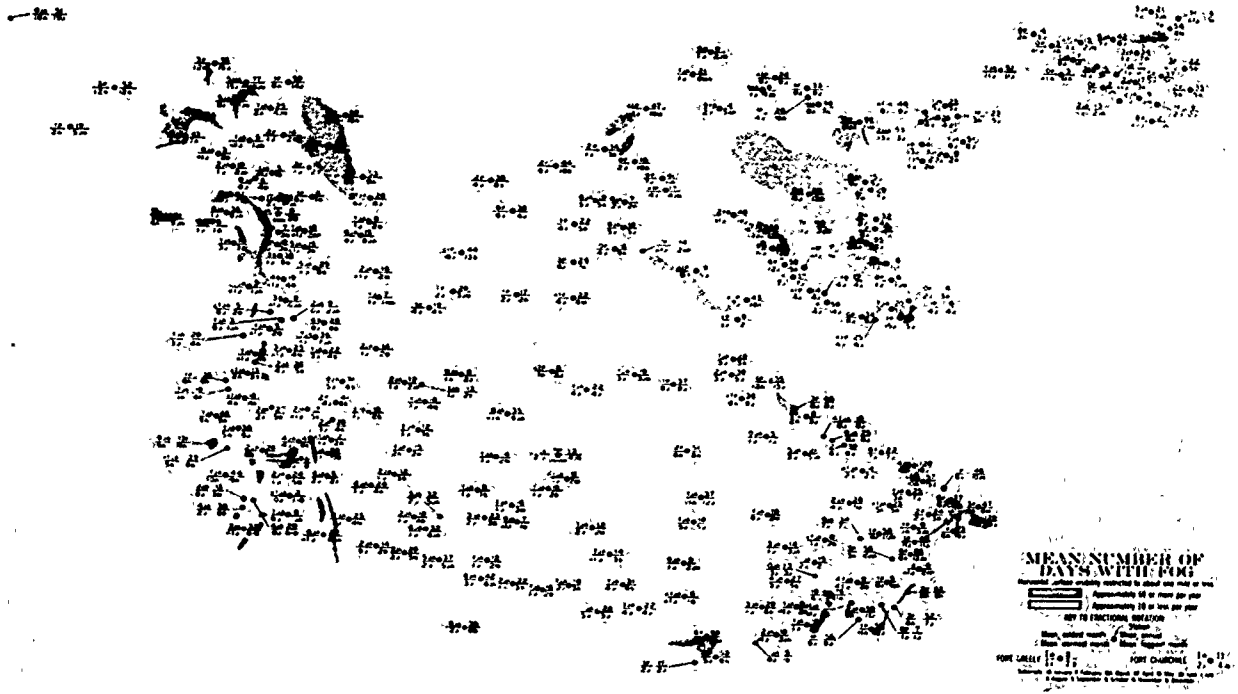


Figure 11


MEAN NUMBER OF DAYS WITH FOG
Approximately 50 or more per year
Approximately 50 or less per year
KEY TO FRACTIONAL NOTATION
FORT LABLE
FORT CHARDIE

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL

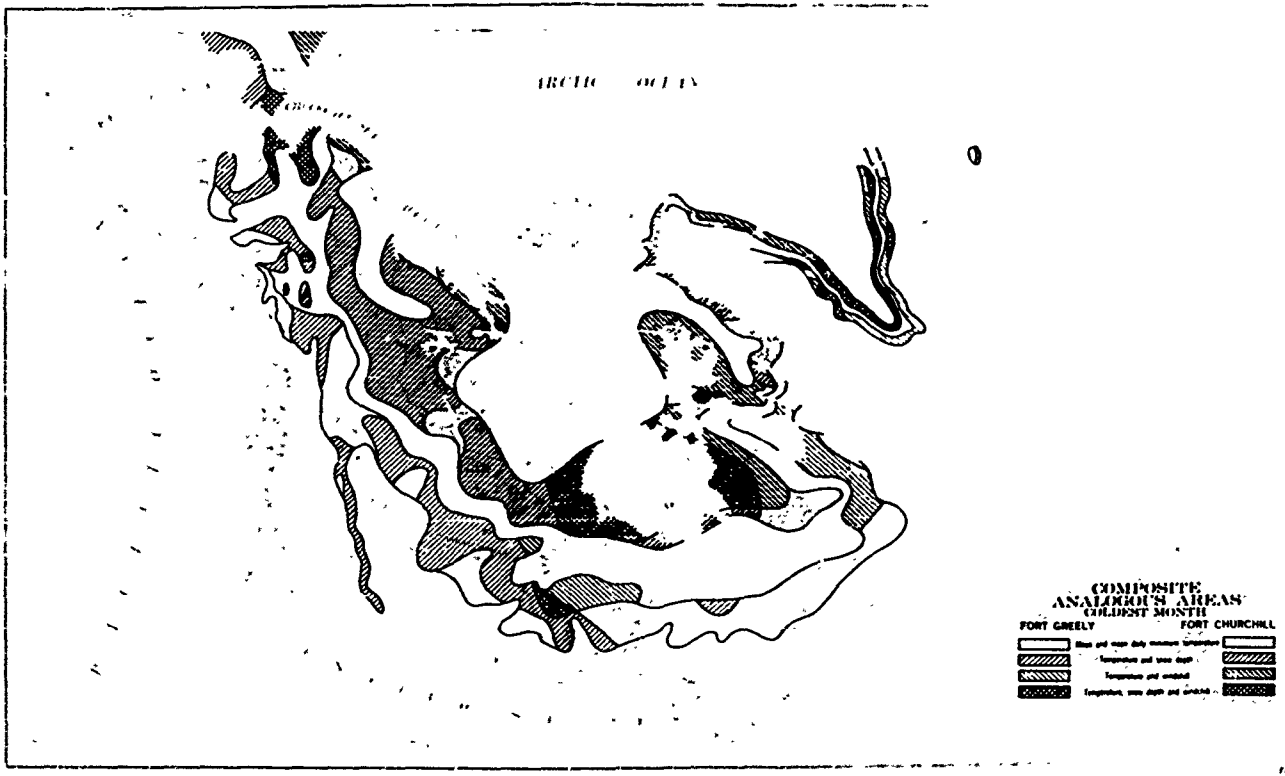
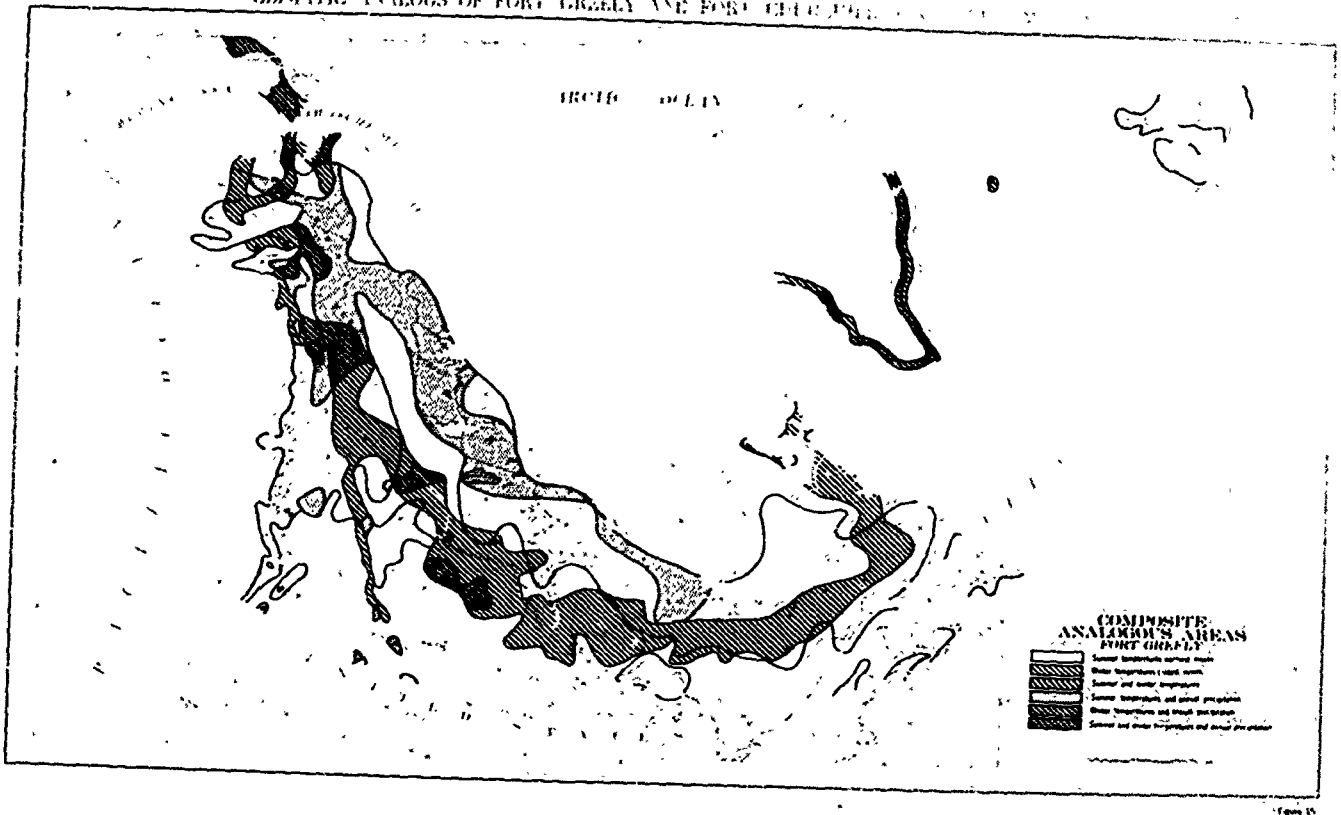


Figure 14

CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL



CLIMATIC ANALOGS OF FORT GREELY AND FORT CHURCHILL – NORTH AMERICA